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MARKET RESEARCH

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Associate Editor

THAT PHASE of business activity, loosely described as distribution, receives much of the blame for present unsettled conditions. We have factories with ample capacity for production and a large population eager to consume their output. But somewhere between, the machinery of our complicated economic structure has slipped a cog or two. Distribution in its broadest sense includes all the problems of making manufactured goods and commodities available to the consumer. This article is confined to that portion of the subject designated as marketing. Marketing deals specifically with selling, advertising, and the branches of manufacture that affect these activities. The author pleads for the wider application of market research and presents suggestions as to procedure.

OUR MANUFACTURING methods have been subjected to careful analysis. We have concentrated on improvements in tooling, in material handling, in wage payment plans and in the many other adjuncts of present-day industrial management. But our progress in methods of marketing has lagged. It is true we have made our goods more attractive to the prospective purchaser; we have made it easier for him to finance his purchases; we have even succeeded in creating new desires, some of which are now considered necessities. But we have not probed deeply into the more scientific phases of marketing—where to sell, when to sell, what to sell, and how. In general, we have failed to accumulate the factual data that will enable us to determine wisely our future course. We use our best judgment in formulating important business policies, but too often this judgment is unsupported by the intimate, basic knowledge which should be its guide.

We have heard of a remedy—market research, or analysis. We picture a large office manned by high-powered statisticians, digesting and interpreting countless reports from governmental and private agencies. We imagine a corps of field investigators gleaning data to feed this imposing array of chart producers. Truly a formidable picture—but one not to be dreamed of seriously by the medium- or small-sized manufacturer. It is often concluded then that market research is something only for industrial giants that can afford these groups of experts, something entirely beyond the reach of the more modest industrial units. Perhaps this frame of mind is one of the greatest deterrents to a more universal scientific approach to marketing problems.

It would appear, therefore, that market research needs "debunking." If the veil of mystery which surrounds its inner workings were torn aside, it would be found that the magic touchstone is none other than that which has solved so many of our problems—just common horse sense. An emotional viewpoint must not obscure the real issue. Market analysis should be approached with the dispassionate delving of the chemist or the vigilant vivisection of the surgeon. Enthusiasm, optimism, hope, and aspiration are highly important to business in general and to selling in particular; but they have no place in the analytical part of marketing. This explains why the efficient salesman is not usually an efficient analyst. The salesman needs enthusiasm—the analyst should avoid it. Sales quotas should not be confused with the market potentials; nor what we'd like to sell with what the field will absorb. In short, the function of market analysis is to collect relevant facts, and by a process of sound deduction, to establish certain conclusions from these facts. Do not let this paragraph leave the thought that business sentiment and psychology are to be ignored. Their existence and influence are facts to be weighed along with the others. The important point is that deductions drawn from factual data must not be influenced by feelings prejudicial to sound judgment.

"But," you well may say, "I admit market research is justified theoretically. But what am I to do about it?" To many, market research means consultation with an outside firm, claiming expertness in a particular field. Many hesitate because of the expense involved or because of doubt as to the ability of the outsider to tell the manufacturer more about his business than he already knows. This is not a plea for or against the market counsellor. Many concerns handling marketing problems know their business and are capable of extending valuable services to their clients. According to the law of averages, others are not so proficient, and their efforts may merely waste the time and money of those who consult them. If one chooses an outside advisor, he should chose carefully. But whether a manufacturer enlists outside aid or not, he should and can apply some of the elementary principles of market planning.

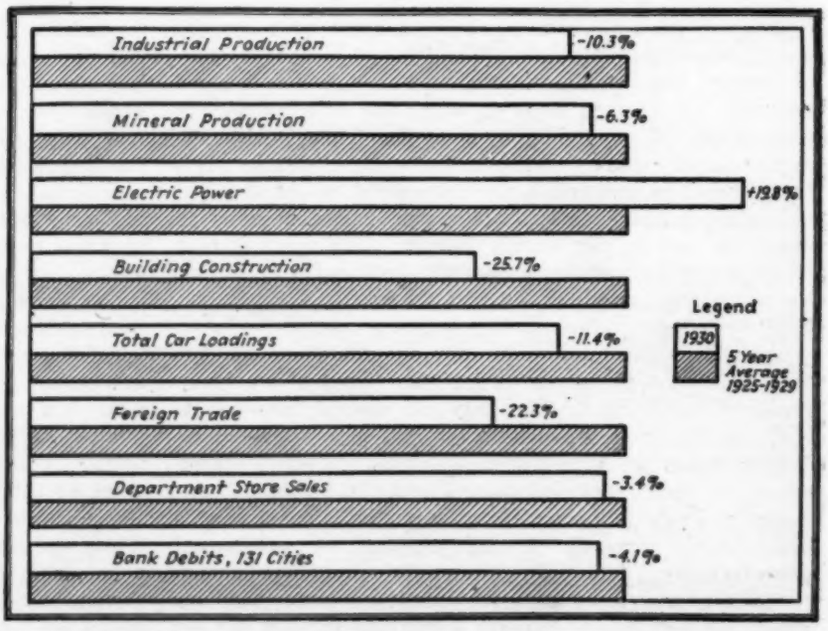
Simple Market Analysis

Let us assume that you are an executive in a manufacturing concern wishing to take an initial step in scientific marketing. Here is a suggestion as to procedure—crystallize your problem into a simple market analysis report. A great deal of information comes to you from government bureaus, from the daily and technical press, from your trade associations, and from many other sources. Other material is available for the asking or at very slight cost. You read some of these data; certain items interest you, many do not. You note the interesting points, usually mentally, and discard the report. Other statistical information you consider too complicated for superficial perusal and file it away. One service of the market analysis report will be to collect some of these loose ends into one place. Various facts will dovetail together and suggest conclusions not foreseen in their spasmodic preliminary inspection. Much of the value in preparing the report will come from the clarification and stimulation of constructive ideas through the process of its compilation. You may hear and read much interesting information and use it to guide your decisions. But set down these vital facts and clip them in a manila cover and their value will be greatly enhanced. The information will be co-ordinated to emphasize its true worth. Much of the detail of arranging these data may be delegated to others, but to obtain the greatest good, keep in mind the general plan of the report and in touch with its progress. In starting, it is well not to be overambitious and try to solve all your marketing problems in one fell swoop. Select a particular phase of your business—one of the industries which you serve or a particular product you are making. Unless your business is small or particularly unified, an attempt to attack your problem of marketing in its entirety may become burdensome or too long drawn out to be of greatest advantage. Remember we are just starting on our first report and do not want to take too large an initial bite.

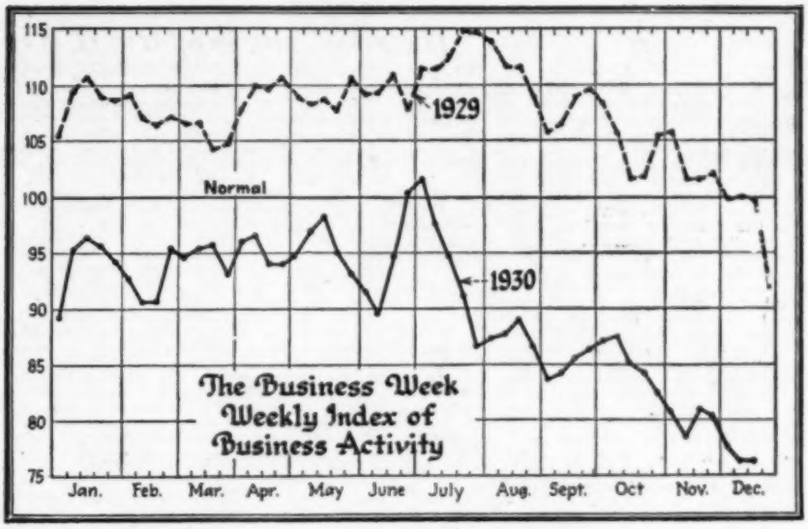
Now what will you put in this report? First a self-analysis of your particular business. You probably have charts filed away showing your sales fluctuations. If not, draw them up for at least five years. Who were your ten or twelve leading customers each year? Why did your largest customer two years ago fall to seventh place last year? In a general discussion of this kind, all the points made cannot be taken too literally; they merely indicate a mode of attack. For some kinds of manufacture the approach to a sales review may need modification. The present suggestions are made with manufacturers of machinery and machine parts in mind. Makers of hats or canners of vegetables will require a different technique. The point is to obtain an insight into sales failures. Most of us like to forget the orders we lost; we do not like to admit that a competitor has a stronger claim on a certain piece of business or that we were outskilled in maneuvering for a particular order. But for the good of the cause, we will overcome our dislike, resurrect these skeletons, and perform an autopsy to discover what really caused the demise. As a matter of fact, we already know the reason in each instance, but if we consider these cases collectively, we may be struck with the weaknesses in our own organization.

Uncle Sam Does the Work

One reason why market analysis should no longer be considered the exclusive tool of industrial giants is that much of our statistical work is done for us. The government is doing more each year to furnish information to the American manufacturer. Surely there is something for our report in the Census of Manufacturers now being released by the Department of Commerce. You should be interested not only in the report for your own industry but also in those for the industries you serve. The Census of Distribution now being made by the same department should disclose some very pertinent data. The Survey of Current Business gives a monthly record of business trends and some figures on exports and im-



A company's future depends largely on that of its industry; the future of each industry depends on other industries. These interrelations link its marketing problems to other business activities



Business indexes show clearly past and present trends; they form a reliable point of departure but must be supplemented with additional data before logical forecasts may be made

ports. Other departments of the Federal Government, as well as state and city bureaus, collect a vast amount of information which is readily available and should find much wider use. For instance, the map on the following pages, showing the concentration of the industrial market was prepared by the Industrial Machinery Division of the Department of Commerce. This map is based on the value of materials, fuel, and power used in industrial production by counties in the United States. It should facilitate the location of branches and the assignment of sales territory, as it locates the industrial market.

Any survey of markets, or of any phase of business for that matter, must evaluate general economic trends as well as the progress of a particular industry. For this purpose, there are the so-called general indexes, which to a degree reflect business conditions as a whole. Check payments, car loadings, steel production, metal prices, and interest rates are all used to indicate what is happening or at least what has happened. For our added convenience, a number of organizations have further boiled down these various factors to a single index which serves to summarize in one figure business activity at any given time. For example, *The Business Week* compiles an index under four main headings: production, trade, prices, and finance, comprising 29 items in all. Such indexes are useful in indicating trends, and from them, certain conclusions may be drawn. They form historic records of variations in business conditions but are not in themselves auguries of the future.

These Much Discussed Cycles

At this point, a few words on the much discussed subject of cycles may be appropriate. The cyclical school of economics advances its theories as the final answer to business prognostication; but the limitations of these theories should not be overlooked. It has been said that in any quantity, having irregular fluctuations over a period of time, may be found a cycle. If the mean of a variable is given, the dips below it must equal the rises above it. The cyclical theory is based on the assumption that the rises and dips follow a certain time schedule and obey certain laws governing their intensity. Since time is the essence of this theory, any appreciable variation from schedule decreases the value of cyclical predictions. The schedules are not as constant as the tides, and we hear explanation as to why a certain cycle is late or prolonged. When such explanations become necessary, the cycle has only a historical value.

Trade associations, banking institutions, statistical services, publications, engineering societies, and chambers of commerce are additional sources of information. Material supplied by them should be culled for particularly relevant items to include in the report. When it is desirable to visualize any particular phase of this information, it may be charted. Graphic presentations of business conditions have been used so widely during the past few years that we may wonder if we have not been overcharted. Perhaps we have; but the fact remains that a trend or a relation between two or more varying factors becomes more intelligible when shown graphically than when merely set down in columns of figures.

What the Report Can Do

Before getting too far into our report, let us consider what we are attempting to obtain from it. Principally, we wish to determine a wiser direction in our sales work and related activities. We may even learn something of value to guide us in design and production. To do this, we must know the magnitude of our market, where it is, how much of it we should attempt to sell, and how to sell it. The magnitude or potential is frequently difficult to determine. There may be a source which makes this information available, or we may have to go out into the field and interview enough men in the industry to obtain an adequate cross-section of conditions. Even when the numerical size of our market has been determined, these personal contacts are always advisable to sound the trend of thought in the industries in which we are interested. Besides the possible users of our product, it may be wise to visit the customers of these prospects. Whenever possible, men who are leaders in their respective industries should be consulted. In this way, new developments, design trends, and future plans may be learned. Figures and statistics form a background for our picture, but the future lies largely in the minds of those men who direct our industrial and financial activities. By keeping in touch with progressive executives in the industries we serve, we may achieve that enviable position where we can anticipate future requirements.

The potential market as a rule may be divided roughly into two main groups, the salable potential—that portion which is already a market for our product—and the ultimate potential. This last named division includes applications, sound from an engineering viewpoint, but which require certain preliminary work or sales promotion to render available. Confining our attention for the moment to the quick potential, we must still differentiate between this and sales expectancy. The potential rep-

LOCATING THE INDUSTRIAL MARKET

MR. WALTER H. RASTALL, chief of the industrial machinery division of the Department of Commerce, recently released the map shown below, with the following statement:

With the idea of meeting the need for a better method of selling to industry, the Bureau of the Census has recently provided a "breakdown" of the census of manufactures by counties. This has made it possible to prepare a map in which the purchases of industry have been reduced to a square mile basis.

There are 19 counties in the United States in which, at this time, the industrial purchases exceeded $1,000,000 per square mile per year. It is also found that in these 19 counties, 32 per cent of the total business is done—a striking concentration of purchasing power.

The second group of counties selected for representation in this map are those that purchase between $100,000 and $1,000,000 per square mile per year. There are 93 such counties, which represent 36 per cent of the total industrial purchasing power of the country. Together, it is found that in 112 out of the 3,073 counties in the country, we have 68 per cent of the industrial purchasing power of the United States.

In the direction of greater refinement, we note that the next group of counties are those that purchase between $50,000 and $100,000 worth of materials for industry per year. In this group there are 69 counties which represent 8¾ per cent of the total—a rapid diminution of intensity.

The next group, those purchasing between $20,000 and $50,000 per square mile per year, includes 149 counties representing 7½ per cent of the total. Adding again, it is found that 330 counties out of the 3,073 account for 84¼ per cent of the total market. This is another way of saying that in the area represented by the counties (white on the map), we have 2,743 counties which, collectively, represent only 15¾ per cent of the industrial market of the country. These might be called, from the industrial point of view, the Great American Desert.

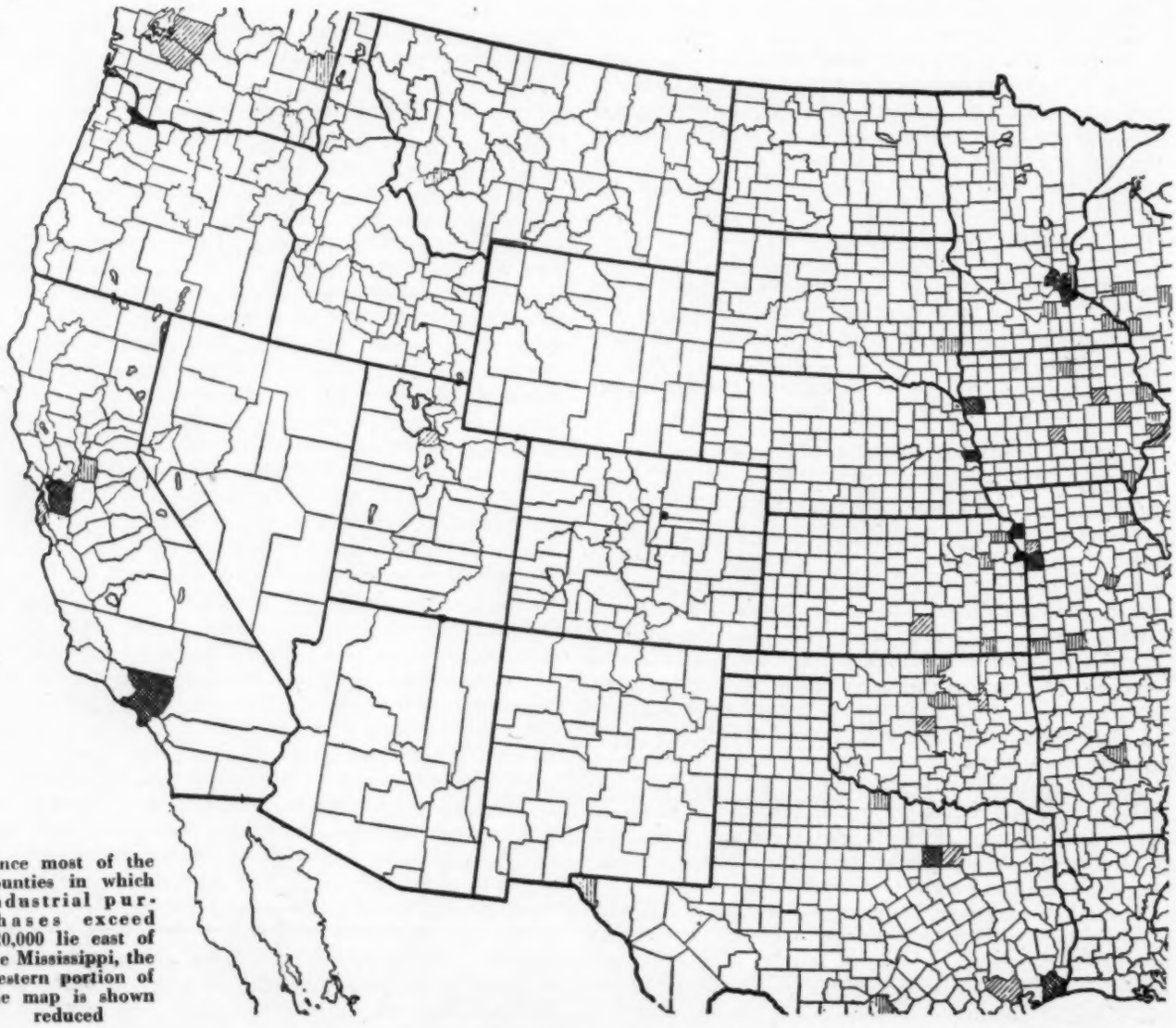
This serves to emphasize the great selectivity of our industrial market. Most manufacturers of products sold to industry will find it necessary and important to be represented in the 19 counties first mentioned, either through branch offices, district offices, or by means of a very high class distributor, thus providing a means for canvassing the territory directly. Probably most of the second group of counties should be covered very carefully. At the other extreme, it can be stated that probably direct sales effort is rarely justified in the 2,743 white counties. Probably further, in many cases such effort would not be justified in the two groups of shaded counties which represent a volume of purchases of less than $100,000 per square mile annually.

This graphic showing puts the sales problem before management in a slightly new form. Consequently, it suggests one of the ways in which some of the present wastes of distribution can be avoided; the cost of traveling, hotel expenses, and the like, in counties where the intensity of business scarcely justifies routine canvassing; areas where sales trips are only justified when specific inquiries show potential business to justify the time and expense involved.

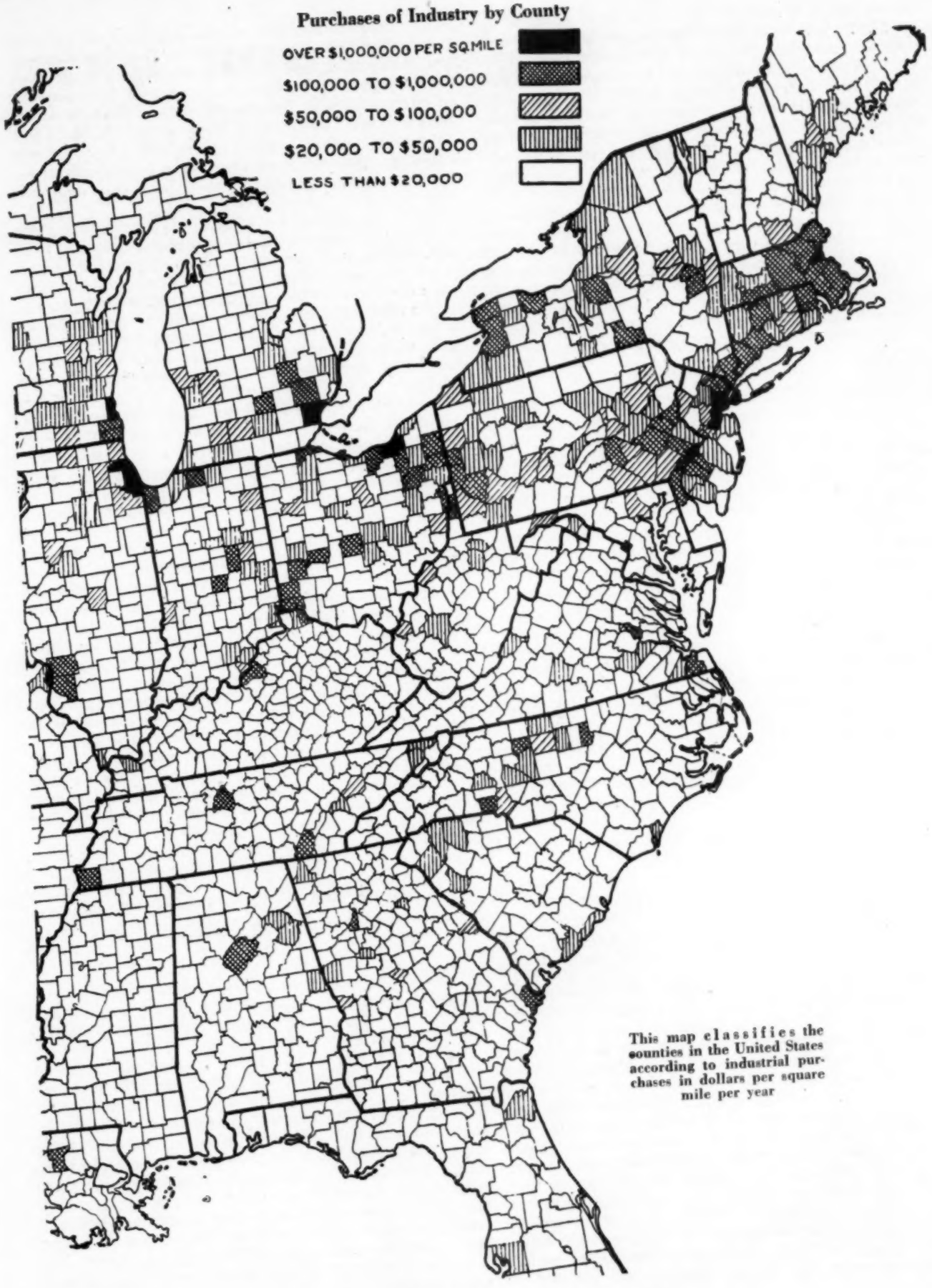
Since this map was developed in the Department of Commerce it has been used by a number of our more important business firms to check their own marketing efforts, and with surprising results.

The next obvious step is a study of marketing areas. Probably each manufacturer, having established offices or agencies in the 19 counties of greatest importance, would wish to add to the territory allocated to each of those offices, additional counties, many of which might even be white, or at any rate, areas of lesser purchasing intensity, as shown on this map.

On request, the Bureau of Foreign and Domestic Commerce can indicate the total of industrial purchases for any group of counties which an interested manufacturer might name. It is, however, obviously impossible for the Department of Commerce to indicate these trading areas on its own initiative. The circumstances of each manufacturer will probably differ from those of all others. The map is presented as a first step in more scientific analysis of the industrial markets of the country.



Since most of the counties in which industrial purchases exceed $20,000 lie east of the Mississippi, the western portion of the map is shown reduced



This map classifies the counties in the United States according to industrial purchases in dollars per square mile per year

resents the total market for equipment or parts of the kind which we manufacture; usually this must be shared with competing manufacturers. We must determine just what portion of this business can be secured on a sound basis. Such factors as prestige, design, sales effort, and financial strength must be weighed to determine our logical portion. It should always be borne in mind that the primary objective is not to obtain the maximum sales volume but to secure the greatest net profit. In attempting to overreach our just share through a desire for expanding sales, we may arrive at the point of diminishing returns. The last ten per cent of sales often represents a net loss. It may cost more to sell than the first ninety and lead to overtime, commitments on expansion, and an overbalanced shop force which would otherwise be unnecessary. When orders are scarce, this warning may seem untimely, but there is no doubt that overzeal is contributory to our economic ills.

The Value of Brevity

The raw material for our report comes then from a selection of written data and from the verbal statements of men in close touch with industrial development. The next step is to organize this material and arrange it in convenient form. An important point to keep in mind is to make the presentation concise by avoiding all literary embellishment. The report's value will be in proportion to the attention with which it is read; a voluminous report may discourage the reader. It is good practice to place detailed memoranda of interviews and other interesting information in a separate folder, as supporting data, leaving only the most vital points for summary in the report proper.

Because of the wide variations in the needs of specific lines of business, no set pattern may be followed in preparing a market analysis report. The following suggested topics are given as a starting point, and will in most instances, require modification:

1. Previous sales performance, with emphasis on past difficulties.
2. Pertinent statistics—shown perhaps in relation to sales.
3. Findings.
4. Development of potential.
5. Conclusions.

These various divisions have been touched upon in the previous discussion, but a few additional remarks may be in order on two of them. "Findings" should include a terse description of the field surveyed, as it affects the product. The more important points should be made first, so expressed as to permit of no misunderstanding. Whenever possible, qualifying phases should be excluded avoiding the habit of the sports writer who predicts that "Harvard is favored to win today but Tech. has great reserve strength and may spring a surprise." An important object of market analysis is to avoid surprises. If a vital point has been uncovered in the course of the survey, it should be stated boldly and without equivocation. If ten or fifteen worthwhile findings have been made, the report is surely justified. Each may be expressed in a well phrased sentence or short paragraph. Amplification belongs with the supporting data, available for the reader with time and curiosity to seek additional information on some phase of the report.

"Conclusions" should follow the same general rules. They should include definite recommendations as to future policy in sales, design, manufacture, and advertising. Specific methods of sales approach and perhaps modification in the sales organization should be described. The recommendations generally cannot be derived from the findings with mathematical exactness but represent an interpretation of the reported data in the light of the analyst's best judgment. Here is where that first requisite of sound analysis comes into play. Certain conditions influencing our sales have been discovered—what's to be done? Only common sense can supply the answer.

Unless we fall into the error of saying the same thing in several different ways, the conclusions, like the findings, will be few in number. In them, we may advise to increase sales effort here and decrease it there; to make certain new sizes and discontinue others; to modify the advertising program; to extend promotional work in various fields; to prepare test data for use as sales ammunition; or to unify the sales story that a united front may be maintained in presenting the company's product.

A report so framed will be simple but replete with significant facts—it will require no more than half or three-quarters of an hour to read. To the casual reader, it may seem brief in proportion to the effort spent in its preparation; but one familiar with the business and its problems will recognize and appreciate its concise presentation.

With the experience gained in this initial attempt, it will be well to turn promptly to another phase of marketing activity. Another of the company's products should be analyzed or another part of the market surveyed. This process should be repeated until the entire field is covered, and the report should be kept currently up-to-date. Markets are dynamic—a single analysis does not answer for all time or even for long. Continuous sales analysis should be conducted as a running guide of company policies; new business must be scrutinized as an indicator of wider opportunities; threatened or lost business must be studied for reasons and remedies. Market analysis reports should be supplemented in the light of additional data. Only by such continuous application can market analysis become an effective tool for executive direction.

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Standard Sizes for Catalogs and Data Sheets

WARREN F. MANTHEI

CATALOGS and data sheets of widely-varying sizes have long been an annoyance to the engineering department. There is no possible way in which catalogs can be filed in a systematic manner.

I think it would be well if the sales managers would get together and decide on three standard sizes of catalogs. Such standardizing would sure be a help in keeping the catalogs in order. The data sheet is another item that can stand improvement. I think that data sheets printed on 8½x11-in. sheets, and punched to fit a standard three-ring binder, would be welcomed by every engineer in the country. If all data sheets were of standard size, it would be an easy matter to file them, and the engineer would have his references at his finger tips. Then he would be more likely to keep them. As it is now, data sheets are put away and are hard to find when wanted.

NEW BOOKS

THE WORLD'S ECONOMIC DILEMMA.—*By Ernest Minor Patterson, Professor of Economics, University of Pennsylvania. 323 pages, 5½x8½ in. Bound in cloth boards. Published by Whittlesey House, McGraw-Hill Book Company, Inc., New York. Price $3.50.*

While not exactly sprightly, Professor Patterson's development of a difficult subject runs along smoothly and should prove enlightening to thoughtful men in every walk of life. He explains logically what the present dilemma facing the nations is, and how they got themselves into their present difficulties. In addition to the general treatment of the world problem, he gives separate chapters on the situations in England, France, Germany, Italy, Japan, and the United States.

Professor Patterson points out the conflict between political and economic expediency, and says quite frankly that political considerations may often be more potent than economic requirements. He comments at some length on the question of restricted immigration. Politically, a nation claims the right to exclude other nationals for various reasons. Economically, has that nation the right to prevent other nationals from exploiting natural resources? Political considerations have decided the point, so far.

Another subject that must be considered both economically and politically is the War debt. From the economic point of view most of the creditors would be far better off if the debts were forgiven, but political expediency makes this procedure impossible.

True to his title, Professor Patterson contents himself with stating the dilemma. He does not attempt to get us out of it. And what a task that is going to be! Few men have a thorough conception of how difficult the dilemma is; the others will profit by a careful reading of Professor Patterson's book. Manufacturers who have read it may not be quite so insistent on high protection after they have studied all the various political and economic effects of such protection in a world of nations that are becoming steadily more dependent upon each other.

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A. S. T. M. TENTATIVE STANDARDS.—*1930 edition. 864 pages, 6x9 in. Published by the American Society for Testing Materials, 1315 Spruce St., Philadelphia. Price in paper cover $7., in cloth cover $8.00.*

A.S.T.M. Standards are recognized as authoritative in the field of engineering materials. The tentative standards, as published in this volume, are printed one or two years in advance of final submission for the purpose of eliciting criticisms to guide the committee concerned. This 1930 edition contains 155 tentative standards, including 25 on metals, 40 on preservative coatings and petroleum products, and 24 on rubber products and insulating and textile materials. In addition, there are tentative revisions of 35 existing A.S.T.M. Standards.

ABRASIVES—*By V. L. Eardley-Wilmot. Four parts: Part I, Siliceous abrasives; Part II, Corundum and Diamond; Part III, Garnet; Part IV, Artificial Abrasives. 119, 51, 69, and 143 pages, respectively. 6½x9¼ in. Paper covers. Published by the Department of Mines, Ottawa, Canada. Price, respectively: 30, 15, 20, and 20 cents each.*

Although much of the material in these books is of interest only to the mining engineer and to the abrasive trade, there is also a wealth of collected information on the characteristics and uses of the various abrasives that will be of service to users of abrasives who want data on the distinguishing features of the different kinds and the reasons for their use. The material in the books is well arranged for easy reference, covering such points as cutting characteristics, impurities, grain sizes, wheel selection, designs of abrasive wheels, and methods of use of the various abrasives.

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ELEMENTS OF MECHANISM. *Fourth Edition —(Rewritten and reset). By Peter Schwamb, Allyne L. Merrill, and Walter H. James. 365 pages, 6x9 in. Cloth board covers. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York. Price $3.50.*

This fourth edition of a well-known college textbook contains a few relatively minor changes from the previous edition. Thus, the subjects of chain drives and universal joints have been given more attention than they were accorded in earlier editions.

The book covers the field of mechanical movements, and treats the subject by studying the motions of fundamental machine elements acting in various combinations. Both graphical and algebraic methods of analysis are presented. Considerable space is devoted to the kinematics of gears and gear trains. Much of the value of the book lies in the great number of illustrative problems and their solutions given throughout the text. This is of particular value to those who wish to use the book for reference purposes, for which it is well adapted.

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MECHANICS (SECOND EDITION)—*By James E. Boyd, Professor of Mechanics, Ohio State University, 384 pages, 6x9 in. Cloth board covers. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y. Price $3.50.*

In this, the second edition of a standard textbook for engineers and engineering students, the author follows the ideas of the first edition. He emphasizes fundamental principles, gives plenty of new examples illustrating the principles and their applications, and uses both algebraic and graphical methods, the latter being given more attention than in the first edition.

One important change is the adoption of the British engineer's unit of mass. There is also some rearrangement of material, some parts being placed in the five brief appendices. Of these the first gives some useful applications of simple mathematics, and the second deals with more advanced problems, including the catenary. The subjects of strength of materials and of hydraulics are not covered, the former being the subject of another book by the same author.

EXECUTIVE FORUM

Brain Fag

THE MOST important job in the drawing office of the Eastside Machine Company was a compressor design needed for an urgent order. Paul Gilmore, Chief Engineer, had instructions to leave no stone unturned to advance it as fast as possible. He had given the task of drawing up the main layout to Tom Hoagland, a new man in the organization, but apparently a capable designer. Gilmore was impatient as he watched the empty stool by the compressor layout where Hoagland should have been working. A few minutes later Hoagland entered the office; Gilmore, glancing at his watch, called to him.

"Where've you been, Hoagland?" he asked. "You know what a rush there is for that drawing and still you leave your desk for twenty minutes."

"I've been taking a smoke and a walk around the block," said Hoagland. "I know there's a hurry for the layout and I'm doing my best to get it out on time."

"Your attitude doesn't show it," said Gilmore. "Only yesterday you refused to work overtime on the job."

"I explained that overtime would not advance the job any," said Hoagland. "Designing is fatiguing work; after a man has worked eight hours he accomplishes nothing in two hours extra. The first night or two might show some apparent gain but after that his pace would slacken. In fact, it's been shown that in some lines of work, overtime actually decreases output."

"We went into that yesterday," said Gilmore. "Let's get back to the subject of knocking off for twenty minutes in the middle of the morning. That certainly doesn't help matters. Suppose the rest of the office followed suit?"

"It might be a good thing," Hoagland contended. "A man can't really concentrate on a design problem for four and a half hours without a rest. A man carrying pig iron does most work when he works twelve minutes and rests three. The same principle holds for mental effort."

"The rest of the office works right through the morning," said Gilmore. "Why should you be an exception?"

"I could sit at my board and go through the motions of working," said Hoagland, "but I'd be only 50 per cent efficient. I'd much rather do my working and resting separately."

"You must remember that you're part of a manufacturing organization," said Gilmore. "Even assuming that you work so intensely that you need a rest, we can't have you wandering about the street during office hours. Besides, designing is 25 per cent creating ideas and 75 per cent pencil pushing."

"I don't believe my needs are different from those of the other men," said Hoagland. "The others simply suffer in silence and allow their capacity for work to dwindle. A lot of study has been done on fatigue lately and much of it applies to this office. For instance the temperature in here is usually between 75 and 80 deg. Each degree above 68 increases fatigue. The light in many parts of the room, my desk included, is inadequate—another cause of fatigue. Under these conditions, rest periods are especially desirable."

"It's also been shown that a person intensely interested in his work tires less quickly," said Gilmore. "Most of the men in this office don't work hard enough to get fatigued. I'd suggest that you get to bed earlier and stick to your desk when you're here."

Suggested by A. W. Knight,
Ipswich, England

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What Do You Think About This Problem?

It has been found that fatigue is caused by a toxic condition created by an excess of lactic acid in the system. Rest allows the body to correct this condition by a natural process. Labor saving devices and man's tendency to take things easier have reduced fatigue in the shop and elsewhere. With this in view, do you favor rest periods during working hours? *American Machinist* invites your views.

. . . Discussion
of Executive Problems

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Home Work

Management, which at one time looked with an approving eye upon the faithful employee with the overstuffed brief-case, has undergone radical changes within the past few years. Although appreciative of the fact that night work in any organization is occasionally a necessity, habitual home work indicates that something is radically wrong either with the individual or the organization. Either the executive has his job poorly organized or he is attempting to carry too much of a load.

Many executives waste valuable office time sorting through trivial reports and petty jobs in the belief that they can concentrate better at home. Such a practice of putting things aside to do at night often becomes habitual.

Although the executive may conscientiously believe that he is serving his organization to better advantage through night work, an analysis would probably reveal the fact that he daily enters the plant with a dull mind and overworked nerves. The company suffers in spite of the written reports he may have amassed.

—H. S. DEELEY, *Planning Engineer, Johns-Manville Company, Ltd., Asbestos, Canada.*

Dole or Control?

The dole will not solve the unemployment problem. It does bring some temporary relief, but in the end it only adds more taxes and high taxes stifle industry and business. It also tends to kill initiative as it is well known that there are many men who will not try to find work as long as they have a little money coming in.

The plan laid out by President Hoover of pushing federal and state public works during business depressions is about the best way out; but at present the government has no way of planning ahead for such events. Things are started too late to relieve much of the suffering.

A board similar to our Federal Reserve Board could be set up which would have all the facts at all times and which would supply these facts to any business or industry asking for them. This would have a steadying effect on industry, thus stopping periods of high production and high costs which are always followed by a period of depression. All except very necessary work could be held back when times were good, yet ready to start immediately upon entering a period of depression.

—THOMAS M. GARRY, *Yale & Towne Manufacturing Company.*

How Much Incentive?

The Halsey plan was devised for use in shops with unstandardized conditions, where the time allowed is based on past performance. Premium rates thus set will result in "easy" and "tight" jobs, depending on the efficiency of the men whose past performance was taken as a basis for the allowed time. When new task times are being set, workers may attempt to "soldier" and establish "easy" times. If the incentive, thus established, allows the worker all of the time saved, earnings will be excessive. The management will not be compensated for establishing a premium plan.

The worker should get 50 per cent of the time saved, because by increasing his production he is using more power and is harder on tools and equipment furnished by the employer. With an equal division, there is not the temptation to cut rates. Payroll figuring is easier for the office, and the worker readily understands it. Unequal percentages complicate matters.

—W. V. LESAK, *Roth Brothers & Company.*

Research or Retrenchment?

Like other side issues in manufacturing, the research department is in danger of thinking itself indispensible. Like the doctor who admitted that 90 per cent of his patients would have gotten well without medical treatment, the research department is likely to derive no small part of its reputation from stumbling on one thing while looking for something else. Grant it credit for recognizing what it stumbled on, yet we still feel skeptical of the necessity or profit of keeping it going at a time when our producers do not have a full week's work every week.

If a given line of experiments is to be followed through to a definite conclusion and the firm can afford to carry it through even though the results be negative, then of course the work should be done as soon as possible. But I am referring to the general hit-or-miss method, accompanied by wise looks and an air of mystery, which cannot be penetrated even by the management. Why not compliment these men by putting them in Henry Ford's classification of executives who should go out in the shop and work in dull times? They might not earn their salt, but they could hardly help learning something.

—E. H. FISH.

Anticipation Without Realization

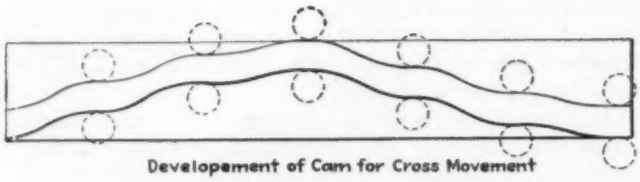
For years our factory declared a half holiday with pay on the opening day of the baseball season. Along in July, we all went to an amusement park. At Christmas, each man received a cash payment based on the number of years worked. Besides this, a weekly bonus was paid, all of which was quite an overhead to carry.

With all these extras, were the men more loyal or satisfied? Not so you could notice it. The first slack period, when the shop operated on part time, some of the best men left to work in other shops working full time. Now this same factory has done away with all bonuses, days off with pay, and presents; it is keeping its force and is showing a larger profit than ever.

—H. FORSCHNER.

Combined Cross and Length Feed for Press Work

CHARLES F. SMITH
Consulting Engineer



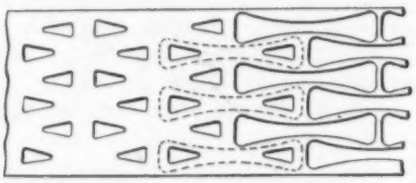


Fig. 1—Method of "nesting" chain links in strip

ECONOMY of material can frequently be secured by "nesting" the pieces to be punched as in Fig. 1. Such a layout saves much stock in comparison with blanking either lengthwise or sidewise with a single die. One alternative is to make a compound die, another is to devise an automatic feed that will handle the strip of stock in both directions. The illustrations show such a feed designed to punch belt links out of a strip in the layout shown. It includes a two-operation die for punching the holes and then cutting the link out of the strip. Both the dies and the automatic feeding mechanism are seen in Fig. 2. They can be used for sheet metal or for thick paper or cardboard.

As shown in Fig. 2 the punches and dies are stationary while the feed rolls move sideways in addition to feeding the strip stock at proper intervals. This can be reversed, however, by making the punches and dies a sort of subpress and mounting them on the cross-slide.

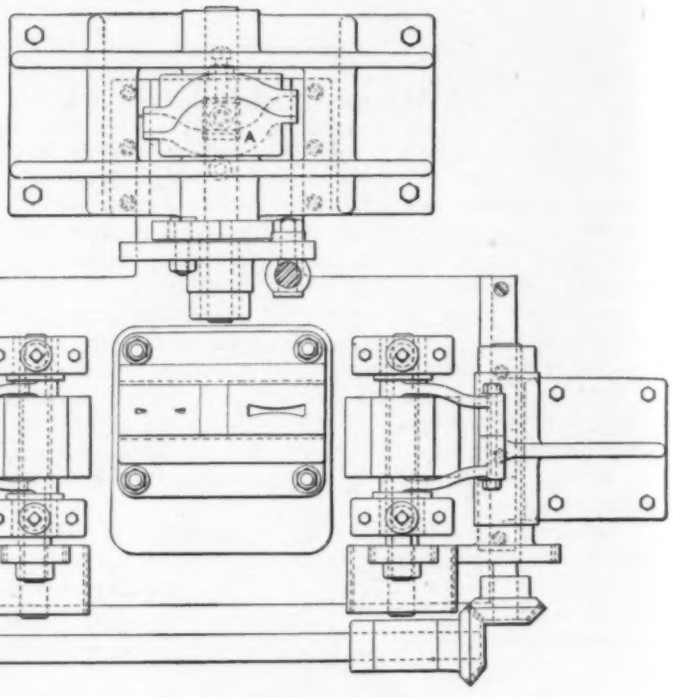


Fig. 2—Plan of dies and combined cross and traverse feed mechanism

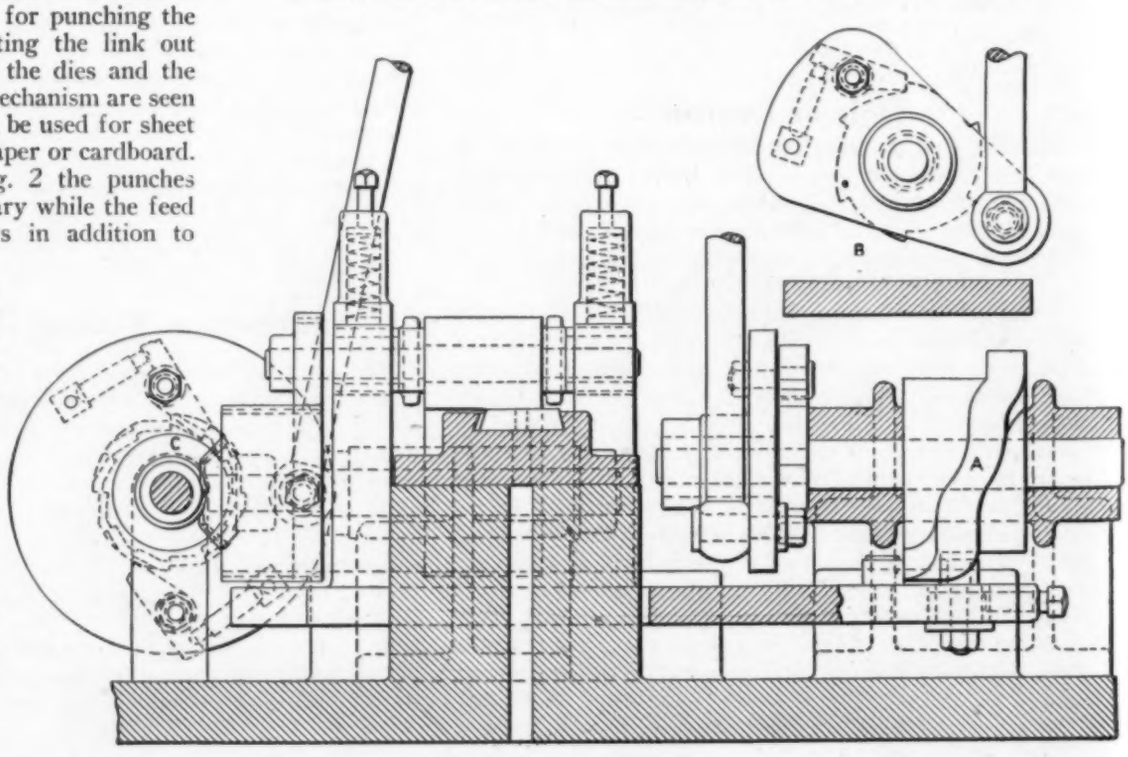


Fig. 3—End view of feed mechanism showing cam and ratchet detail

The cross movement is controlled by the raised cam *A* that has a roller on each side. The cam is laid out as in Fig. 3 to give the right movement at the proper time. This cam is operated by the ratchet shown in detail at *B*, Fig. 3, and gives six positions across the strip. The cross feed cam must be laid out to move the strip two spaces each time so as to leave space for the ends of the next row of links in between. Then it must move the strip only one space to start the next row, after

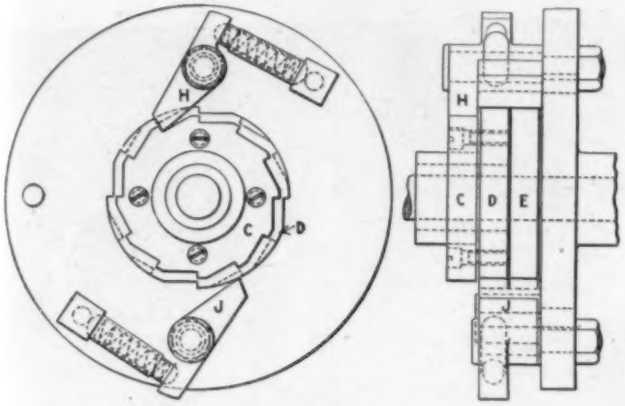


Fig. 4—Details of pawls and ratchet for intermittent traverse feed

which it continues the double spacing as the strip moves back. The cam which controls this movement is operated by a link from the press slide.

In the meantime the lengthwise, or traverse feed, must only move the strip after every third stroke of the press. Then it must move half the center distance of the link plus a clearance of $\frac{1}{32}$ in. This traverse feed is secured by an arrangement of pawls and ratchets.

A 12-tooth ratchet *C*, shown in detail in Fig. 4, is fastened to a second ratchet *D* which has but three teeth and is blank between. Both of these ratchets are loose on the shaft and are used solely to control the movement of a third ratchet *E* that is fixed on the shaft controlling the traverse slide. This slide is moved by the bevel gear train shown in Figs. 2 and 3.

Pawl *H* moves ratchet *C* one tooth at every stroke of the press. At every third stroke the pawl *J* drops into a notch in ratchet *D*. Pawl *J* is of double width and at the same time drops into ratchet wheel *E*, turning it one tooth at the next stroke. In other words the blank portion of ratchet *D* holds the pawl *J* out of action while the strip is moved across the press for two strokes and then permits the ratchet *E* to be turned to feed the strip endwise.

Many modifications of this mechanism can be made to suit various conditions and secure automatic feeding for work that is staggered in the sheet or strip.

■

An Anomaly in Installment Buying
Discussion

C. J. Morrison
Consulting Engineer, Meyer, Morrison & Company

ON PAGE 273, Vol. 73, of the *American Machinist*, Mr. L. O. Brown suggests that banks finance the purchase of machinery. Banks at the present time make some loans for the purchase of machinery, but such loans are of necessity limited, and there are many good reasons why the banks cannot go extensively into such loans.

The money which a bank lends is not its own, but belongs to the depositors, who are entitled to it upon demand. A bank must therefore keep itself in a fairly liquid condition to be able to meet these demands, which means that only a small portion of its funds may be loaned on mortgages or may go into the fixed assets of a concern. When a bank needs funds, there are only three ways in which they can be obtained promptly, as follows:

1. By demanding payment of any "call loans" which it may have outstanding.
2. By borrowing from the Federal Reserve Bank on U. S. Government Bonds as collateral. Nothing else will be accepted.
3. By rediscounting customers' notes with the Federal Reserve Bank. However, there are very rigid restrictions upon the notes that may be rediscounted, and no note will be accepted which is drawn for over three months or the proceeds of which go into fixed assets. These restrictions eliminate notes for the purchase of machinery.

When a bank does make such a loan, it requires the borrower to be strong financially outside of its machine investment, as the bank does not wish to have to look to the machinery for the payment of the loan. The banks have learned by expensive experience that used machinery brings very little at a forced sale. The condition is not analogous to the financing of automobiles, radios, refrigerators, and similar articles, as all of the large finance companies, making loans on such articles, do so under what is known as a repurchase agreement, which means that if a loan is not paid, the seller must repurchase the article from the finance company for the unpaid balance. Possibly, if the machinery people would be willing to enter into such an agreement, machinery could be financed more readily.

■

Polishing Steel with a Mirror Finish

R. J. O'Conner
Contract Plating Company, Inc.

WHERE steel has been in the storeroom or in the dealer's stock for a considerable period, it becomes pitted, and any description of a method of polishing steel should take into account this condition. Unfortunate as it may seem, an extra operation is necessary to remove these pits.

For the first operation (omitted if there is no pitting) No. 90 grain abrasive should be used; for the second, No. 120; for the third, No. 150; and No. 180 for the fourth. For these four operations a dry felt wheel is used. For the next operation a No. 180 wheel that has been used dry for a day is used as a grease wheel. Use tallow, not oil.

For the final operation, to remove wheel drags and scratches, I recommend grade "A" Lea compound. This compound should be applied to a sewed buff, allowed to dry for a few seconds, then tallowed. Buffing the parts with this will take out the wheel marks left by the No. 180 grease wheel and will leave a mirror-like surface.

SILENT GEARS *for* QUIETER CARS

■ After Reo engineers conceived the idea of double - pitch herringbone gears for more silent operation, the company's production men developed the methods of manufacturing described here ■

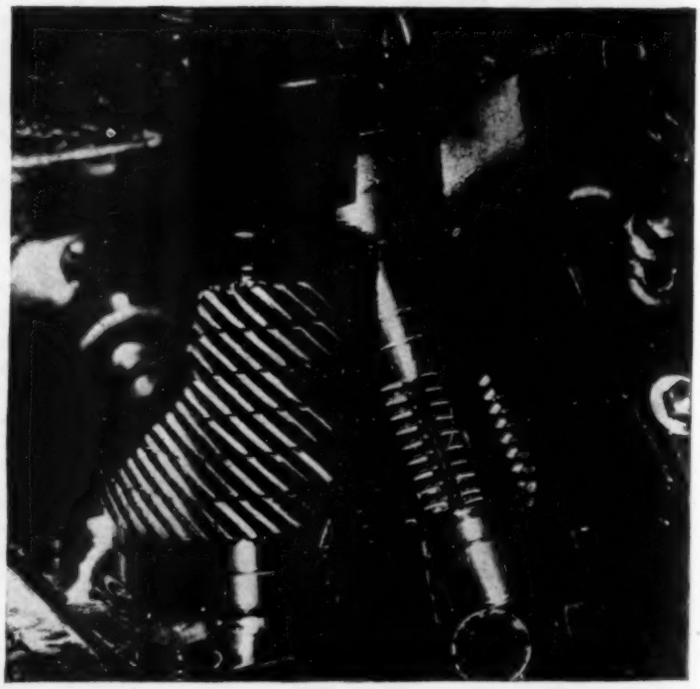


Fig. 1—Hobbing six gears on a mandrel designed to afford an extremely rigid support for the gear blanks

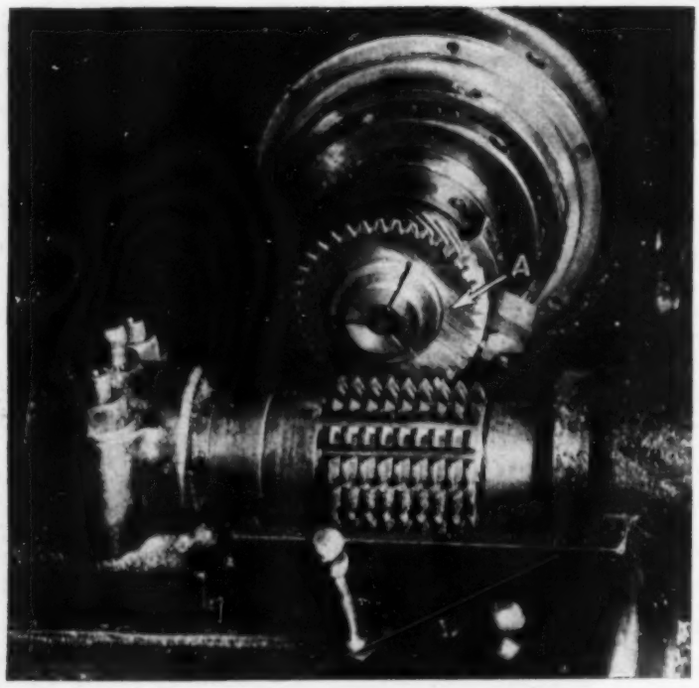


Fig. 2—Beveling corners of gear teeth

QUIET OPERATION is one of the features demanded by modern automobile buyers, and the minimizing of gear noises in transmissions is a very important step in that direction. Some designs secure quietness by the use of internal gears; others employ the helical type. Reo engineers, however, not only decided to use herringbone gears, but to make them in two halves, one of which would have a coarser pitch than the other half. This, it was found, tended to prevent a synchronous hum. If any hum was made by one half of the gear, it would be of a different note or period than that of the other half, and one would counteract the other. To produce gears of this type involved some unusual problems. The methods used are here described and illustrated.

Gear blanks are rings of alloy steel. The bores are finished, after which the side faces are ground square on a Blanchard surface grinder, using a flood of cutting compound. Six gears then are clamped on a mandrel and are hobbed at one time, as illustrated in Fig. 1. A feature of this set-up is the substantial support at both top and bottom of the mandrel. Corners of both ends of the teeth then are beveled by the hob shown in Fig. 2, the gear being held on an expanding mandrel, which facilitates rapid handling

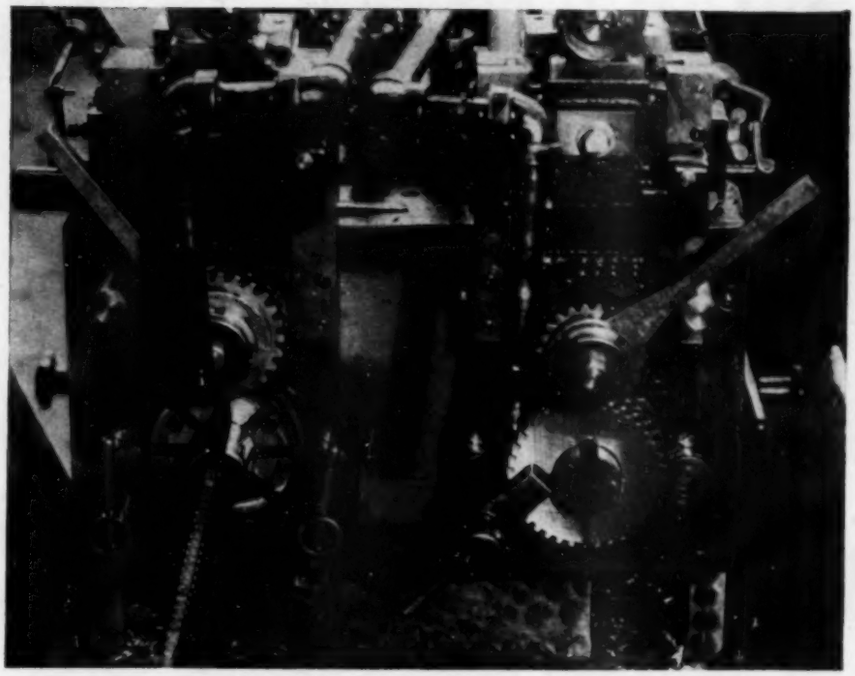


Fig. 3 — Keyways are broached in this machine after the gear halves are located with reference to each other by meshing with the master gear above. The second broaching holder, at the left, is shown without the work in place

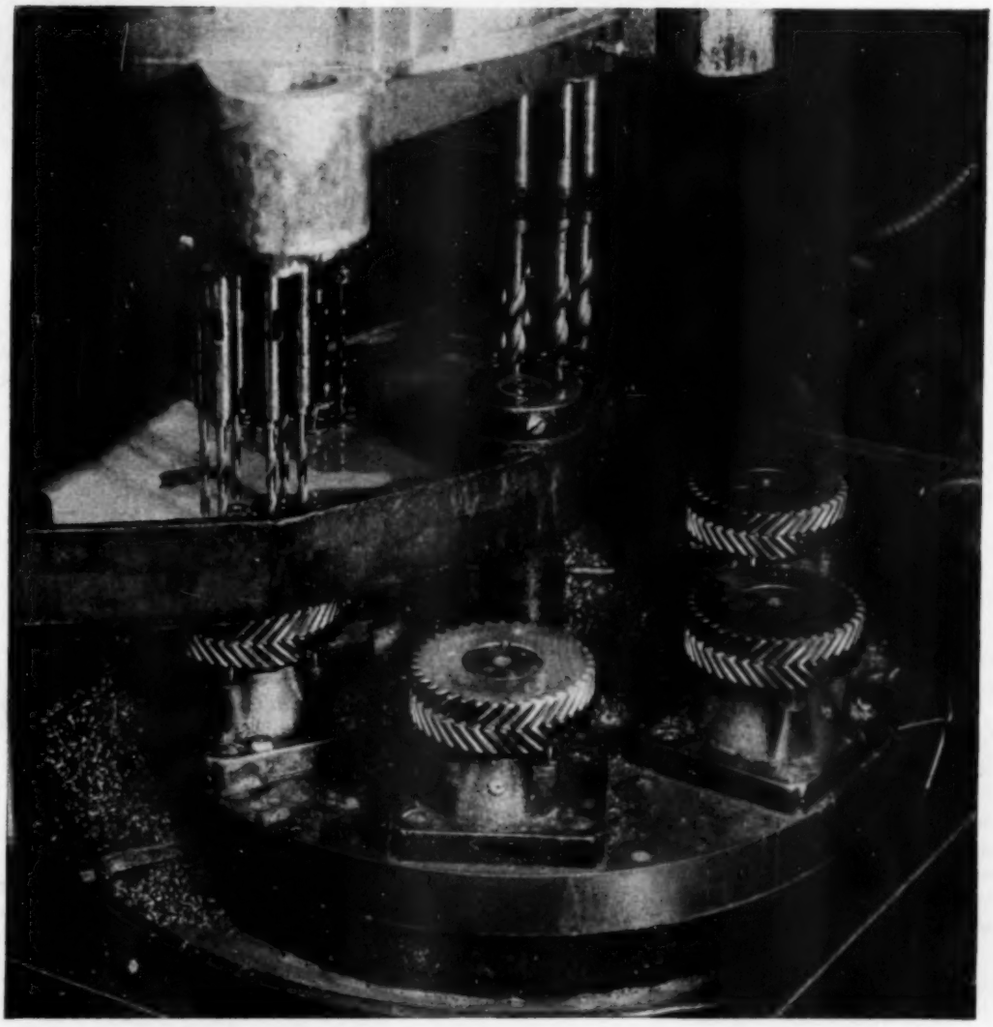


Fig. 4 — Setup for drilling, reaming and countersinking mating gear halves

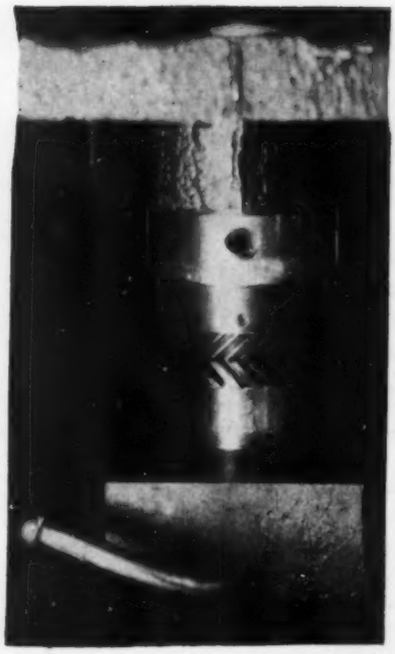


Fig. 5 — Gears mounted for riveting the two halves together. Two types of press are used in this operation. One is shown above and the other at the right

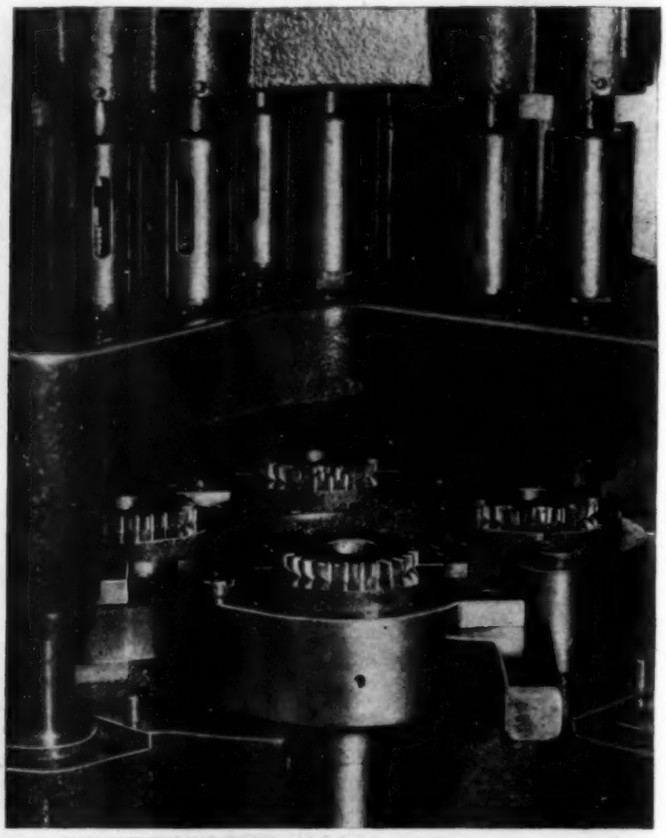


Fig. 6—Drillpress with multiple head arranged for cutting off the ends of alternate teeth of gears

and makes for accurate centering. A small plug between the teeth, as shown at *A*, locates the gear with relation to the hob and also tends to act as a driver.

Keyways are broached on the machine shown in Fig. 3. To insure proper relative location of the two halves of the herringbone gear, both halves are broached simultaneously while they are positioned exactly by meshing with a master gear. This master gear, made up of a fine- and a coarse-tooth gear fastened together, is provided with a handle so as to be turned easily. When this handle rests against the stud shown projecting from the machine, the gears are in position for keyway cutting.

In succeeding operations the two half gears are kept together and are located in reference to each other by the keyway. Mated halves of the completed herringbone gear next are placed in position on the six-station drilling fixture illustrated in Fig. 4. They are centered on steel studs with close-fitting keys. At the first work station six holes are drilled, and at the second these holes are reamed. In the third position six drills countersink the holes for rivet heads.

Before riveting, the gear halves are mounted on a mandrel with a key to maintain alignment. Two types of riveting presses, pictured in Fig. 5, are employed. Care is taken to make sure that the rivets hold the two gear halves as though they were one solid piece.

Another feature of the Reo transmission is the cutting back of every alternate tooth of the gear that acts as a positive clutch in engaging the top or direct speed. This arrangement affords twice the space for initial engagement of the teeth and insures ready engagement of the positive clutch even at high speeds.

As illustrated in Fig. 6, a substantial drill-head fixture, provided with end mills and mounted on a heavy-duty drilling machine, serves to cut back the gear teeth. There are three work stations, the spindles at each carrying four end mills. By dividing the work among three stations ample center distances are allowed between spindles, and substantial bearings can be provided for each spindle. This clutch gear is solid on the end of the splined shaft, which can be seen in the front or loading position. After being properly located, the shaft is clamped securely by the handle shown. The whole fixture turns under the drillhead and is indexed by the bearing plug at the left entering a steel bushing in the ears provided at four points of the body casting.

Employees' Title to Inventions

Leslie Childs
Counselor at Law

It GOES without saying that an employer is entitled to the product of the labor of an employee produced in the course of the employment. And especially is this true where the employee was engaged for the particular purpose of making the article or articles produced.

But when it comes to the right of the employer to claim title to the brain product of an employee, in the form of inventions, we find quite a different situation. Here the general rule seems to hold that, even though an employee is engaged to make improvements on machinery or equipment of the employer, the latter may not claim title to patents thereon taken out by the employee, in the absence of an express contract.

To put it another way, while the employer will acquire title to the article made, and perhaps a shop right to its use in his business, free from the payment of royalties, the mere fact that it was made or created on his time and at his expense, and in the course of the employee's employment, will not, of itself, vest in the employer title to a patent taken out thereon. There is a nice point here for the owners of machine shops, manufacturing plants, and others engaged in research work that may be productive of inventable improvements.

In a leading Federal case bearing upon this point, the defendant was employed as chief engineer by the plaintiff, a steel manufacturing company. The defendant's salary ranged from $4,000, at the time of his engagement, to $10,000 per year, when he resigned some years later. The defendant had entire charge of the plaintiff's mechanical department, including research, to the end that improvements might be made.

During the course of his employment, the defendant, a high grade man of an inventive turn, made valuable improvements upon the equipment of the plaintiff, took out patents thereon and assigned them to the company. This went on for several years, and the plaintiff appears to have acted upon the assumption that it had legal right to these assignments, since the improvements covered were made in its plant. But in the course of the defendant's employment, there was no *express* contract between the parties that obligated the defendant to make assignment of the patents.

Thereafter, the defendant resigned from his position and retained six letters patent for inventions that he had made just prior to the submission of his resignation. The plaintiff demanded that he assign these patents to it, but the defendant refused on the ground that they were his personal property. The plaintiff thereupon filed instant action to compel the assignment to it of the patents, and based its right to them upon the following grounds: That the making of patentable improvements in its machinery, equipment, and product was a part of the duties of the defendant, for which he was employed; that, therefore, the relationship of the parties, as employer and employee, made it the duty of the defendant to assign patents pertaining to the line of the plaintiff's business, since they were evolved in the course of the defendant's employment.

In support of its contention that this was the understanding between them, the plaintiff pointed out that the defendant theretofore had assigned such patents without protest or objection.

The defendant explained his prior assignment of patents on the ground that he was grateful to the plaintiff for the employment and made the assignments as a voluntary act, but denied that he was in any way legally bound to do this. The case reached the Court of Appeals, Third Circuit, on the above issue, and in affirming a judgment for the defendant, the court reasoned as follows:

"We do not think the [plaintiff] here, in the absence of express contract to that effect, from the mere relation of employer and employee, in connection with the facts and circumstances disclosed by this record, is entitled, in equity and good conscience, to an assignment from the defendant of his whole right, title, and property in the inventions in question. If entitled to anything [plaintiff] is only entitled to a shop right or license that would enable it to use these inventions without paying a royalty therefor, a right which does not strip defendant of his entire property right in the product of his own inventive faculty.

"We have been referred to no case, nor have we been able to discover one, in which, apart from express contract or agreement, and upon the mere general relation of employer and employee and of the facts and circumstances attending it, the employer has been vested with the entire property right in the invention and patent monopoly of the employee, to use the patented invention. Such a right in the employer, the employee may be estopped to deny, by the fact of his employment and his conduct in relation to the use of his inventions by his employer; and to that extent, and not further, have the cases gone." (137 Fed. 403, 71 C. C. A. 207.)

The foregoing case constitutes a clear presentation of the weight of judicial authority on the question here involved. This authority takes the position that, in the absence of an express contract, an employer is in no position to claim title to the inventions of an employee, and the fact that they are created in the course of the employment will not change the rule.

In the light of this decision, there is no gainsaying the importance of the subject to employers, where employment contracts with mechanics and other skilled workmen, contemplating patentable improvements on equipment or product, may be made from time to time. Certainly, if the employer intends to claim title to such patents, the point should be covered by express stipulation in the contract of employment, and not left to the haphazard chance of proving such agreement by oral testimony, or the conduct of the parties in relation to the employment.

The Foreman's Round Table

AGE AND ITS COMPENSATIONS

"ANOTHER of Williams' accepted practice notices?" queried Ed, as Al posted a numbered slip on the shop bulletin board.

"Yes, Ed, come and have a look. And in case this isn't your day for reading, I'll help you out! Here goes: 'Principles Involved in Our Organization Policy. First, that respect and confidence between employers and employees be established and maintained; Second, that a profitable and equitable incentive be provided for both; Third, that there be established a measure for determining a rate of wage; Fourth, that a rate of wage be definitely related to the energy, skill, experience, and knowledge required to perform the work. Second paragraph——'"

"Never mind the second paragraph, let's digest the first one first!"

"You don't mean that you disagree with anything there, do you?"

"Well, yes and no. The first two points are the same old stuff Williams has been feeding us all along, and there's nothing wrong with the third one, particularly if they let us set our own measures for our own wages. But that fourth one, that's a stinger!"

"How so, Ed, it seems fair enough to me."

"But not to me. I suppose 'experience' means length of time at the job or like jobs, and mebbe 'skill' comes in there too, but what about age and seniority? They're not even mentioned here; but even the Army and Navy have to watch 'em pretty closely—and other people who've tried to disregard age or seniority in applying wage scales have run into a pile of trouble."

"I don't think so, Ed. Of course, the five years age and seniority you have on me should count for something, but if I do just as good or better work than you do, I should think I ought to get just as good, or a better, salary, age or no age. Energy and skill depend on the individual; they aren't always an attribute of age or knowledge. A man should be paid on the basis of what he's worth to the organization, not on a basis of what men working around him get, or how old they are."

"Oh yeah, Al, and wouldn't that be fine! The first thing you'd know everybody'd be figuring they were getting gypped."

"Why should anybody figure he's getting gypped? Each man is hired at a definite rate to do definite work; the details are nobody's business but his own and the management's. If his work goes unrecognized, he ought to have intelligence enough to see it and move along. His own worth to the organization, seniority or no seniority, ought to decide his pay."

"But it doesn't, Al! A lot of men are willing to work for less than they're worth just to be sure of a job."

"Should that be the funeral of the skillful or energetic man? If one organization can't pay him what he's worth, there'll be another one that can. His age, experience, or seniority is all bosh—it's what he can do that makes the difference!"

"Beautiful theory, but it doesn't work, Al. You've got to consider age, seniority, and class of work when you set a wage, not just an individual. If you don't, you'll be making adjustments all the time. For instance, you can't give one apprentice more than another, even if he—"

"'Is doing better work.' Is that your song and dance, Ed? It's just too bad! That boy of yours has been doing such a peach of a job as an apprentice that I was about to get him a little raise for encouragement. But of course, if Ed Senior doesn't agree with my policies, I'll just have to keep the boy at the same old rate!"

Should skill, age, experience, knowledge, or seniority affect wage rates? Should they be set by class or group? How may individual achievement be recognized, if not by wage increases?

▸ ▸ ▸ Discussion of Former Topics

Check and Double Check

The practical way to determine the proper supply of tools to carry in the tool crib is through keeping a card record of tools called for and not available. The card shows how many of this tool are carried by the tool crib. A notice that the tool called for is not available is sent to the man's foreman. He notes any loss of time due to a change over being necessary or the lack of another job which can be given to the man. This notice is returned to the tool crib and filed in back of the tool card. These should be totaled weekly and entered on the card showing hours lost. Generally, three months will give ample data on which to make a decision on the economy of standing pat or purchasing additional tools. By continually building up the lacking tools, the conflict between departments and workmen will be reduced to the practical minimum without an excessive tool crib inventory. Proper tool crib supervision will curb loose tool checking methods.

Without a doubt, the small shop should check out all lathe and planer-type tools, and a list of those held out overnight should be on each foreman's desk the first thing every morning. Tools not actually being used, or more economically left in a set up, then will be returned to the tool crib.

One of the reasons for demanding the return of small drills is that they can be taken outside of the plant. The cutting tools are not easily used in a drill at home. Few mechanics have a lathe at home in which they could use the company's toolbits. Any excess of cutting tools scattered around the plant is merely indolent or inefficient management.

—E. E. GAGNON, *Mechanical Superintendent, Raybestos-Manhattan, Inc.*

In the Driver's Seat

The hyper-nervous man seldom makes the best foreman, though it is surprising how, in some cases, sheer will power can be made to conquer the outward expression of extreme nervousness. The Great War provided many instances of such conquest of nerves by will. In general, however, the man of calm temper and strong nerves, other things being equal, makes a much better leader.

A foreman should know no favorites; delinquencies by whomsoever revealed should be tackled tactfully, but firmly, as and when they arise. Much depends upon not only the incident but the manner of the attention. There are errors and errors. Many men are careless rather than incompetent. Indeed, some brilliant workers are apt to be indifferent to details. In parentheses, one of the ablest engineers the writer knows, after putting a culprit through the mill, immediately sets about devising ways and means for minimizing the loss within the smallest limit possible. Those of his assistants who have been "told off," then helped out, remember with gratitude the one thing and the other. They have not resented the gruelling, but they have felt like kicking themselves, and they have certainly endeavored not to be caught napping again. Such chiefs are essentially fair men, and despite the growl—there is little bite—they lead.

The driver may succeed with some men. The leader succeeds with all men. Such foremen as lead feel that incompetence in any member of the team is a reflection upon themselves. They accept it as a personal challenge. Men are fortunate who serve under such leadership. They are themselves receiving the best possible tuition for like positions of responsibility.

—W. R. NEEDHAM, *Stafford, England.*

Do Errors Cancel Each Other?

Le service de vérification est crée pour inspecter toutes les pièces et en particulier la premiére d'une série et faire ses observations avant de continuer le travail. S'il n'en fait aucune, le contremaître peut continuer de bonne foi puisqu'un organisme spécial a reconnu son travail bon et de ce fait c'est cet organisme qui est responsable pour autant que le lot soit fait dans les mêmes conditions que le type. Certes, quand il y a une erreur, quelle qu'elle soit, le contremaître mérite un blame, mais le principal qui est responsable, c'est l'inspecteur. Alors, il n'est plus necessaire à l'usine.

(Translation) The inspection department is established to inspect all pieces and in particular the first of a series; it should make its inspection before the work is continued. If it makes no complaint, the foreman can continue in good faith, since a special organization has recognized his work as good and because this organization is responsible that the lot should be made under the same conditions as the sample. Certainly, when a mistake is made, whatever it may be, the foreman merits rebuke, but the principal one responsible is the inspector. Otherwise, he is no longer necessary to the works.

—GEORGES DESCOTTE,
Montigny le Eilleul, Belgium.

Sauce for the Goose

It seems to me that this unnamed general manager has made innovations which are very practical and should be successful. The purchasing department is the chief instrument for bringing in the many items needed in the plant. The production manager does the scheduling of parts and fabrication. These two practically direct and control the amount of supplies, material, and finished parts on hand in the shop. Therefore it is entirely logical that they should be made strictly responsible for the conditions of the stock in the various store rooms. This will do away with many alibis and much buck passing.

It is comparatively easy for a mere director to find a goat to lay the blame on for shortcomings in the performance of his duty. But when he is directly responsible for the physical condition of tangible articles he will watch his step and have materials or parts ready

when wanted. The general manager has made a wise move. He has definitely named and located the proper responsibilities on two of the sometimes most irresponsible departments of the plant. —L. O. BROWN.

A Friend at Court

Friendship offers a means of knowing a man better, both personally and professionally. From this standpoint, a company should profit by a man's wise choice of friends for positions under him, assuming honest and serious appraisal of the hired man's capabilities.

Every executive should be on the lookout for men in whom to place confidence and responsibility. It is sometimes necessary to develop friendships in order to discover the qualities that would warrant such a trust. Consequently, it is only natural that a man should look to his friends first, when he desires to hire an associate. The capabilities of a friend are better known and the degree of trustworthiness is less of an unknown quantity than that of a man who is less familiar. Friendship should be the first requisite to hearty co-operation in an organization.

In making the above statements it is assumed that the friendship is of the type that has arisen from the mutual admiration of each other's professional capacities. Friendships arising from lodge memberships, bridge clubs, and so forth are to be treated cautiously in respect to making use of such a relationship to increase the plant personnel. —M. F. SAXTON, *Allis-Chalmers Manufacturing Company.*

The Fortune Teller

To most men a psychology test is a lot of bunk, and in a way they are right. The questions asked seldom have anything to do with the work to be done, and some of the best mechanics are poorly educated. In fact, some of them don't even know what a psychology test means. I don't believe that such a test will bring any better men into the fold. There are a certain number of good mechanics, and the firm offering the best working conditions and highest wages will get the largest number of these men.

Psychology tests, however, have their good points, even though they do not appear to bring any financial gain to the firm. If every firm gave such tests it would cause more men to study and develop their mentality.

—W. J. OWENS, *Foreman, Newport Rolling Mill Company.*

Who's Who in Industry

It is practically certain that in order to be a skillful mechanic, a man must have more training than the average worker. When men study to advance themselves in the technical field they usually have in mind receiving larger wages for the knowledge they have acquired.

Industry will always require skilled men, it could hardly exist without them. If the machine operator was to receive the same amount of wages as the toolmaker or machinist, the condition would unquestionably lead to a serious industrial problem. It would discourage the younger generation in training for skilled occupations because they would derive no benefit for their additional efforts. Trained men find their work less irksome, and become more aspiring if the wage scale is balanced in their favor.

A man who has the ability to solve the most difficult problems in his occupation can be termed an expert. I readily agree on qualifying him as such. I do not agree that a branch of a trade, or so-called single-action trades, should be on a par with more complicated occupations; however, if the man becomes skillful in the branch he is engaged at I would term him a specialist.

—P. L. BUDWITZ.

Trade Secrets

It seems to me that an employee who has sufficient originality and ability to discover or invent some new process should receive a fair monetary remuneration for his ideas. The chief problem, of course, lies in the fact that before an idea can be accurately appraised it has to be revealed. An employee, therefore, is not sure that the idea will not be used without his receiving anything for it. On the other hand the company certainly can make no proposition without knowing just what is being offered.

It might be a worthwhile plan in any industry which is likely to have valuable suggestions and ideas emanating from its employees from time to time, to set up an arbitration committee composed of some executive of the company and a senior foreman from the shop. These two individuals could pass on the merits of any device and make a recommendation for or against its acceptance. It would be of the utmost importance that the personnel of the committee be of the very highest type, men who have the confidence and trust of prospective inventors. The chief value of the committee would be in direct ratio to the confidence and trust that they could build up in the course of time by establishing a reputation for fair dealing and honest recommendations. No doubt some individuals would feel unfairly treated, but the general opinion would support the committee if their judgments were fair. —H. GREENHALF, *Walkerville, Canada.*

The Exception to the Rule

The fact that most wage incentive plans set their rates on the productivity of the average worker, make it obvious that the exceptional worker always benefits.

This is a natural law; it does not constitute a reason for upsetting a carefully organized piece-work scheme. The fortunate exceptions merely serve as an example for their slower work-mates.

Where the work is of a repetitive nature, prices can in a measure be stabilized and guaranteed with a provision that any improvement in jig design, methods of handling, or new equipment, shall make prices subject to revision.

It has been my experience that few foremen resent a workman earning more than they. In the final analysis they know they are far better situated from every angle. Generally, such cases are few and far between. I am also inclined to believe that the piece-work system will gradually disappear and be supplanted by day work, a natural sequel to the mechanization of industry.

—ROBERT S. ALEXANDER.

WHEN INTEREST LAGGED

How an existing apprentice system was made more effective by enlisting the co-operation of the foremen

C. J. FREUND
The Falk Corporation

MEN will support almost anything if they can play a part in its direction. This is a fundamental principle of human behavior and the basis of democratic government the world over. The principle has frequently been applied to industry, particularly in the field of human relations.

For instance, it was recently applied in the Falk Corporation to give renewed life to apprentice training. The system had not gone to pieces. In fact, we thought it was pretty good, although we are willing to admit prejudice in the matter. At any rate, the ordinary problems had been solved long ago. Whatever skepticism about apprenticeship may have existed among department heads and foremen had long since disappeared. More applicants for training presented themselves than could be hired. In one year, three hundred and thirteen applicants were registered although only seventy-one could be engaged. The Falk apprentice system was known and accepted by the people in the community as a legitimate educational enterprise. Relations between apprentices and other employees were friendly; co-operation between department heads and apprentice supervisors was excellent. Every month a certain number of applicants were examined and a few hired; every month with almost equal regularity a certain number of apprentices completed their course. Many of the graduates became foremen and inspectors.

Nevertheless, we were not satisfied. We felt that the apprentice system needed careful going over. The apprenticeship committee met and decided that certain changes were necessary. In the first place, the very fact that the system functioned smoothly created a problem—a problem of complacence. Everything connected with apprenticeship was gradually becoming drowsy.

Clerical work and certain manual operations frequently become more effective as they become mechanical. But mechanical effort is futile in the development of the faculties, knowledge, and skill of men. Such efforts must always be intelligent, conscious, and enthusiastic. The plan and purpose of the work must always be kept in mind, and it is necessary to take into consideration individual traits of the men who are being trained. We thought that the time had come to remind our organization once more of these fundamentals.

Of course, our department heads and foremen were constantly confronted by production problems. They could tell at any time what progress had been made on order No. 7-432, or any other, but many of them could not remember just now whether they had five apprentices in their department or seven, or whether the tall blond lad at the other end there, was named Henry or Joe. Of course, production must always remain the first job of the shop official, but a certain proportion must be maintained between the effort devoted to production and the effort devoted to apprentice training. It was our opinion that the proportion was shifting at the expense of apprenticeship. Since attention to production could not be reduced, the entire organization had to be startled into greater activity so that more energy might be devoted to apprenticeship. We all needed a big jolt.

But that was not all. We needed certain information which we did not have. That our apprentice training system functioned smoothly did not prove that it fulfilled all our requirements.

Apprentice training had been established in the plant to accomplish certain results. We needed to know if we were getting those results. Were we training the kind of men we needed? Were the boys getting the kind of training they needed? Were the graduates equally valuable to us if they remained in our employ and to other

employers if they wished to go out into the industrial world? Had apprenticeship become a means for recruiting the entire organization? Had we removed from the minds of shop officials the problem of where to get suitable men for the plant? Were we building up a corps of men from whom foremen and other key men could be selected as rapidly as vacancies occurred?

The most obvious source of information regarding all these questions was the organization itself. We discussed the matter in a meeting of the apprenticeship committee and decided that no roundabout methods could be effective. The simplest way was to call a meeting of foremen and department heads and talk over the whole apprenticeship question with them.

Three-fold Purpose

We hoped for a three-fold result from the proposed meeting. In the first place, we expected to get from the foremen and department heads most of the information concerning the effectiveness of apprentice training which we wanted. Secondly, the meeting and the events leading up to it would stimulate their interest in the subject so they would give more attention to apprenticeship than before. Finally, we expected an application of the principle already mentioned. Foremen and department heads would be invited to discuss the development of apprentice training in the shop. They would then feel that they had a part in the movement, and justly so, because their ideas and suggestions would be invaluable; the whole thing was not a mere gesture. They would support a system built upon their ideas; and their support was essential. Apprentice training without the vigorous approval of management is out of the question but it is equally inconceivable without the whole-hearted support of the shop officials. The idea of such a conference was one thing; the conclusion of a successful conference was something altogether different.

Have you ever attended a meeting in which the chairman rose and announced, "We have called this meeting to consider the question of better cost control in the various departments of the plant. Who wishes to open the discussion?" If that statement included the entire plan for the meeting, you remember what happened. There was a long, awkward pause while men looked at each other, wondering who would speak first. Either to save embarrassment or under pressure from the chairman, some of the bolder spirits stood up and pronounced meaningless platitudes, which were all that could be expected of them under the circumstances.

We did not want that kind of meeting. We required active participation in the proceedings by as many as possible with honest expression of opinion and useful suggestions. We knew that we could not expect these unless our meeting were carefully planned in advance and unless foremen and department heads knew what would be considered so that they could organize their thoughts beforehand. During the year, a group of twenty or twenty-five shop officials had taken part in foremanship conferences under the plan of the National Metal Trades Association. These could be depended upon to support and stimulate the discussion. The vice-president and works manager proposed that a dinner meeting be held to be followed by a blackboard discussion after the manner of the foremanship conferences.

There still remained the problem of subject matter for the meeting to be arranged in the form of a coherent plan. Also, the time had come to inform the shop officials of what was contemplated. Accordingly, a letter was sent by messenger to thirty-five foremen and department heads announcing the plans for the meeting. With the letter was inclosed the following schedule of questions, with the request that they be returned within a week:

1. Are apprentice graduates fully qualified as mechanics? Are they as good as they should be after three or four years of training? If they are not, what suggestions have you to offer to improve the courses?
2. Is the discipline of apprentices satisfactory on the whole? Of course, occasional infractions of discipline cannot be avoided. What corrections are needed in this direction?
3. Are school arrangements satisfactory? Is the attendance of apprentices at school arranged to cause the least inconvenience in the shop? Do boys learn the theoretical side of their trade in school as they should? What do you suggest?
4. Are work schedules for apprentices correct? Do they provide the greatest possible general experience in the allotted time? Do you think that changes are necessary?
5. Are you satisfied with the type of boys whom we engage to become apprentices? Do you find it easy to work with them and do they appear capable of high development? What suggestions have you to make?
6. Is it your opinion that the apprentices get out a sufficient amount of work on the average? If not, how can the matter be corrected?
7. Is the attitude of apprentices toward their work satisfactory? Is their attitude toward their trade satisfactory? Do you see the need for special effort along this line?
8. Does the present merit system for rating apprentices appear satisfactory? Do you find that it permits you to express fully your opinion of the ability and deportment of apprentices in your department?
9. Have you any suggestions to make which are not covered in the above items?

None of the questionnaires came the first day, one or two came on the second, then they came in a rush. Every foreman in the group replied. No less than three answers were submitted to every question; the fourth question produced eighteen suggestions. There was material, and plenty of it, for the meeting.

Building Good Men

In the first place, it was evident—and extremely gratifying—that most of them were convinced that apprentice training in the plant functioned as it should, that it was building good men for the organization. All agreed that the institution should remain.

Of course, there was some difference of opinion regarding methods and procedure. That was to be expected. "Apprentices should receive suitable credit for high school work which they have done," was suggested by one foreman. Another wrote, "No allowance on the contract should be made for high school work other than graduation because there is no direct relation between high school work and trade training." In the opinion of one department head, "The apprentices who came to us several years ago were much superior to those we get now." On the other hand, one of his foremen thought that, "We have a better class of boys in the shop now than ever before."

Various improvements were suggested to strengthen the apprentice course; evidently the foremen and department heads had devoted time and thought to the questions and were taking the conference seriously. One of them suggested a longer period of probation than the three months which had been established. Another proposed that foremen should meet with apprentices at regular intervals and discuss with them the grinding of tools, the placing of gates and risers, the maintenance of equipment, and other shop problems. Again, several agreed that apprentices needed to be given more direct, personal attention, and that they should not be blamed more readily than praised. Other suggestions were made which bristled with controversy and immediately established themselves in our minds as the principal material for the conference:

1. The courses for regular and high school graduate apprentices should be longer. This was startling in view of the traditional four- and three-year training schedules.
2. We emphasize production too much; training is the fundamental purpose of apprenticeship.
3. Apprentices get too much supervision and direction; they should be left more to their own resources.
4. Modern manufacturing methods destroy initiative in the mechanic; this must be made up some way.
5. Because of modern tendencies, a greater proportion of the foundry apprentice course should be devoted to molding and core-making machine work.
6. Apprentices should bring complaints to their foremen before they discuss them with the apprentice supervisor.

When all foremen and department heads had answered the questions, the apprentice supervisor tabulated the returns, discussed them with the apprenticeship committee, and prepared a program for the conference.

The Conference

The day of the conference finally arrived. The nine principal questions for discussion had been written on the board. After dinner, the works manager gave a talk to open the meeting and wisely made it brief. This is about what he said:

"We have always trained apprentices in the plant of the Falk Corporation. However, it is about ten years now since we established apprentice training on a systematic, organized basis. It is time for us to take inventory of what we have accomplished. You are all fully entitled to express your opinion concerning the effectiveness of our apprentice training work. Please be outspoken and say just what you think, even if it's not favorable. We know that our apprentice training work is not perfect, and we depend upon you to tell us what needs to be corrected. We welcome you all to this meeting and trust that our work this evening will be pleasant as well as profitable."

The apprentice supervisor then took charge of the meeting in the capacity of leader of the discussion. He announced that each of the nine principal questions was to be discussed in turn. He erased them from the blackboard and then rewrote the first question and under it wrote all the suggestions which had been submitted in answer to it without, however, revealing the names of those who made the suggestions, so that the discussion might be as free as possible. All present were given an opportunity to present reasons why each separate point should be adopted or rejected. If no prevailing opinion became evident, a vote was taken. Approved items were noted by the assistant apprentice supervisor.

Results

One by one, after thought and discussion, each disputed point was settled one way or the other. Thus, it was determined that courses should not be longer than four and three years, for regular and high school graduate apprentices respectively. It was pointed out that there should be no need for making the courses longer than the common and traditional period and that the effect of a longer course could be produced by more concentrated instruction without lengthening the time. The contention that modern manufacturing methods destroy individual initiative was also rejected because the majority felt that complicated modern machinery provided sufficient opportunities for excercising initiative to compensate for the effects of mass production and repetitive work. The group was of the opinion that production should be emphasized, but as an element of training, that the proportion of machine molding in the foundry course should be left entirely to the apprenticeship committee; that ordinary complaints should not be taken by the apprentices to the foremen before they are taken to the apprentice supervisor, because the function of the supervisor is precisely to relieve the foremen of such problems; nor would they admit that the supervision of apprentices is overdone.

The results of this conference, which by the way had to be adjourned to a second evening, were very gratifying indeed. In the first place, a number of worth-while recommendations were made:

1. That optional post-graduate courses with attractive pay rates be established in all departments.
2. That credit for previous shop or school work be determined after a suitable probationary period under at least two foremen.
3. That the foundry training for drafting apprentices include more actual molding.
4. That foremen and department heads give monthly talks to apprentices on shop problems, in addition to school attendance and talks by the apprentice supervisors.
5. That occasional talks by outside speakers be arranged.
6. That an "excellent, very good, good, fair, and poor" basis be substituted for merits and demerits in the rating of apprentices.
7. That separate training floors be established in all departments.
8. That all foremen be required to learn the names of the apprentices in their departments.

The apprenticeship committee was to consider these proposals at a subsequent meeting.

But there were other results of the conference more valuable than these suggestions. The first of these was an almost violent stimulation of interest in apprenticeship. For days following the conference, there was no end of discussion in the shop concerning minor difficulties which were not considered at the meeting. Voluntary committees of five from the foundry, four from the machine shop, three from the pattern shop, the production manager, and the chief draftsman visited the vocational school to learn at first hand how the apprentice classes were handled. All branches of apprentice training work went forward with renewed energy, cheerfulness, and effectiveness.

HOT DIPPING TO INHIBIT CORROSION

L. K. WRIGHT
Consulting Engineer

CONSIDERABLE controversy exists among electrochemists, metallurgists, and technicians engaged in metal research, as to the most effective rust-resistant coating which can be applied to protect ordinary commercial iron and steel. To date, cadmium offers the most effective protective qualities, being considerably superior to zinc, especially where exposure is made to salt-laden atmospheres, such as are encountered along coastal terrains. But cadmium is relatively expensive as compared to zinc.

Electrodeposits of zinc from sulphate baths do not provide so good resistance to corrosion as do those obtained from cyanide electrolytes. The zinc cyanide baths, and the cadmium cyanide formulas, are known for their fine deposits and remarkable throwing powers. In this latter respect cadmium is quite the peer, as it enters deeper recesses, depressions, and machine threads more readily than zinc.

In aircraft, because the weight factor is of prime importance, fittings usually are coated with electrodeposits, for such metallic films can be kept within the finest thickness limits and the weights definitely controlled. Electrodeposits serve admirably for simple fittings, shapes, and the external surface of tubes, but where intricate designs are encountered the only satisfactory solution is to revert to the hot dip method.

Some aircraft manufacturers take no further precaution against corrosion than to spray or coat the fitting with dope or lacquer, either before or after assembly. But those who utilize electrodeposits as protective means usually attempt to compromise the fitting design so that plating facility is secured. Fittings, however modified, usually present a difficult plating problem, for the inevitable inner surfaces and crevices are subject to more or less shielding. These vulnerable portions usually are "light" or entirely devoid of plating, and at the same time provide space and surface for the retention of moisture.

Best for Power "Gliders"

Power "gliders," so-called, must be ruggedly constructed, cheaply and quickly assembled, provide ease of repair, and be of such material that their parts will wear out before they rust out. For such work, electrodeposits probably will be supplanted by the cheaper, quicker, and more effective hot dip process for both zinc and cadmium, especially since the temperature of such molten baths have no deleterious effect upon the steel fittings. Where welded or brazed sections are met, the temperatures employed serve to anneal and work out strains. Parts coated by immersion in a molten bath have a thicker film, which adds to the weight, but the crevices and inner portions are coated and protected to an extent not possible to secure with electrodeposits.

Since either metal can be used for the hot-dip process, the method described below may be employed for either. Cadmium has a melting point of 970 deg. F. (321 deg. C.) and zinc 786 deg. F. (420 deg. C.). With cadmium the temperature must be controlled more carefully and the surface kept thoroughly covered to prevent oxidation. If cadmium is overheated, brown fumes, dangerous to health, are evolved, but with proper ventilation and ordinary care the two metals are handled with equal ease. Overheated zinc gives off dense white fumes.

How Cleaning Is Done

Parts to be coated are cleaned first to free them from all rust, scale, sand, grease, or other foreign matter. To obtain a thoroughly adherent film the article must be clean. Fittings may be freed of sand and scale by tumbling, either wet or dry. Since tumbling must be done carefully, it is best to make a study of the problem before proceeding; if excessive room is left in the tumbling barrel the pieces may be bent, especially if too great a speed is employed. If too tightly packed, little or no cleaning results. But where properly done, tumbling offers a cheap, certain manner of cleaning parts.

Sandblasting is also an efficient method of cleaning, especially when automatic apparatus is employed. In hand operation the tendency is to clean the dirty spots with excessive zeal and possibly thin down a section, while the apparently clean surfaces are neglected.

Pickling is the most common treatment used in small plants. Unfortunately, it is often a neglected operation, little or no attention being given to such items as temperature and concentration. Pickling should be controlled carefully, so that a minimum of time and cost is involved. The tendency toward embrittlement of thin material must be considered carefully, so that no untoward effects are produced in steel parts. This effect usually is not serious if the pickling is properly done, but it is likely to be detrimental unless correct concentration and temperature is maintained and overexposure avoided.

One good way to clean steel parts and prepare the surface by pickling is as follows: Immerse the parts in a hot (200 to 212 deg. F.) alkali bath, such as one made up with from 4 to 6 oz. of caustic soda or potash per gallon of water, and allow them to remain for about five minutes, to remove grease and dirt. Rinse in hot water (about 200 deg. F.), immerse in a hot (160 deg. F.) pickle consisting of about one part of commercial sulphuric acid (60 deg. Baumé) to 20 parts of water, and allow the parts to remain until clean. The time required depends entirely upon the condition of the steel. Overpickling must be guarded against, and may be observed through the formation of pits and seams in the parts. Experiment alone will determine the length of time re-

quired to secure the desired effect without injury to the material.

After removal from the pickle, parts should be rinsed in water and immersed in a fluxing bath, consisting of one part of commercial muriatic acid (18 deg. Baumé) to fifteen parts of water. The salt, which coats the parts after they are removed from this bath and is dried quickly, either over a hot plate or in a warm chamber, acts as a flux. As soon as the parts are thoroughly dry they should be passed to the molten bath, for if allowed to remain in the atmosphere the clean surface rusts very quickly.

The Molten Metal Coat

Coating with molten metal is done in steel pots. For small objects, a pressed steel vessel, or preferably, a row of such vessels serves to good advantage. For large objects a kettle may be formed of sheet steel by making a trough or V-shaped section with a rounded bottom if desirable. Such a vessel can be made of any length desired, the two ends being welded in place. Ordinary structural steel sheet is a good material for forming these larger vessels, for the quantity of carbon and nickel they contain is so small that no alloying with the cadmium or zinc results.

Oil- or gas-fired furnaces, automatically controlled, provide excellent heating means. Zinc spelter melts at about 786 deg. F. and the temperature required for small work is usually about 900 deg. F. For larger work the temperature is raised and held at about 950 deg. F.

With proper care, kettles have long life, especially if precautions are taken not to allow the metal (zinc or cadmium) to solidify, and if excessive temperatures are avoided. In firing a new kettle, not less than 24 hours should be utilized in melting down and bringing a batch to the proper operating temperature. The dross should be skimmed off carefully and the surface of the melt covered with salammoniac. The commercial gray or impure variety is cheaper than the white or refined material and does not volatilize so readily; therefore it is to be preferred. As soon as clean parts to be treated have dried after the pickling process described below, they are immersed in the metal bath, and are passed slowly through the salammoniac cover so that the surfaces are fluxed, and no spluttering of hot metal occurs. Parts are allowed to remain submerged until their temperature is the same as that of the bath, at which time all bubbling action ceases. It is best to wait for a short period beyond the point at which gas bubbles are evolved, so that the coating will be without gas holes or pits.

Parts then are withdrawn slowly, and if inspection reveals any blank or uncoated spots, salammoniac is applied by hand and the parts are redipped. If the article is completely coated it should be jarred sharply or brushed to remove surplus metal and flux. Parts then are allowed to cool slowly. If a spangled appearance is desired it can be produced by sprinkling with water and allowing the parts to cool in the air.

Baths should be kept clean and no dirt or foreign matter allowed to enter. Silver, tin, lead, antimony and arsenic are to be guarded against particularly, for if present they affect the weathering of the resulting coatings.

The hot dip method is recognized as being somewhat costly in metal consumed, but when the results it gives are demanded, there is no alternative method to compete with it. Other processes, such as Sherardizing, Schoop, and the like, do not give the protection offered by the dipping process, for in hot dipping, crevices are sealed shut and filled with metal. Small interstices, which are likely to remain uncoated in electrodepositing, are sealed against moisture and corrosion in the process.

Thus a quick, cheap, and effective method is available for the quantity production of fittings with films that survive even the rigors imposed by aeronautical and marine applications. Automatic machinery can be used to do specific jobs of hot dipping, and since it is simple in design, first and maintenance costs both are low.

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Blank Diameter—*Discussion*

T. SMITH
Sutton-In-Ashfield, England

B. SPECTOR, on page 389, Vol. 73, may be correct when he says that the cut-and-try method is cumbersome and costly. I have been designing and making dies for all kinds of material, for 33 years, and I maintain that the cut-and-try method is the only one that gives usable results in making the many shapes now used in the fancy decorated tin box trade, the intricate blanks required for toys, and the various shapes in the domestic line, such as many-sided vases and plant pots. In round work, blank diameters are a simple matter, but even here we finally get the exact size by cut and try. When I am ordering forgings for round dies, I use the tables found in Frank A. Stanley's book, "Punches and Dies," pages 363 to 368. With suitable allowances, I find these right for forgings, but when it comes to the final blank, the cut-and-try method is the only one we trust.

But it is not so costly as is made out—most of my men can get out a blank in six tries for a fairly intricate shape, which I am sure is as quick as making a drawing of the part and the many computations required by the method outlined by the writer of the article.

There is a point which most writers on the mathematical method for blanks seem to miss; that is that the metal used for the product governs the blank size. We use ordinary tin twelve thousandths thick for most of our work, but even this varies slightly. The depth of draw from the same box of tin will vary as much as $\frac{1}{16}$ in., but when we come to soft brass and aluminum the depth will vary as much as $\frac{3}{16}$ in the same die. This in itself proves that computations are only guesses, unless the drawing material is taken into account.

The die itself, how it is made, the allowance left between the top tool and the centre or drawblock, the size of the buffer or spring, even the speed of the press all have a bearing on the blank. This latter point was one which gave us no little trouble in my younger days. All blanks were pressed out by hand, that is pulling round the flywheel. We noticed that when finished, the die gave a little less draw than when using the press by hand, and we put this down to the speed of the press. If anybody doubts this let him try a blank pulled by hand, and one with power; then measure the depth. The difference may not be much, but it is there. All these points have to be taken into consideration when making dies for the trade. Dies have been returned to their makers because the blanks required were not up to sample.

However, articles like this are well worth study, and the use of tables such as those mentioned are helpful.

AMERICAN MACHINIST 1930 INVENTORY

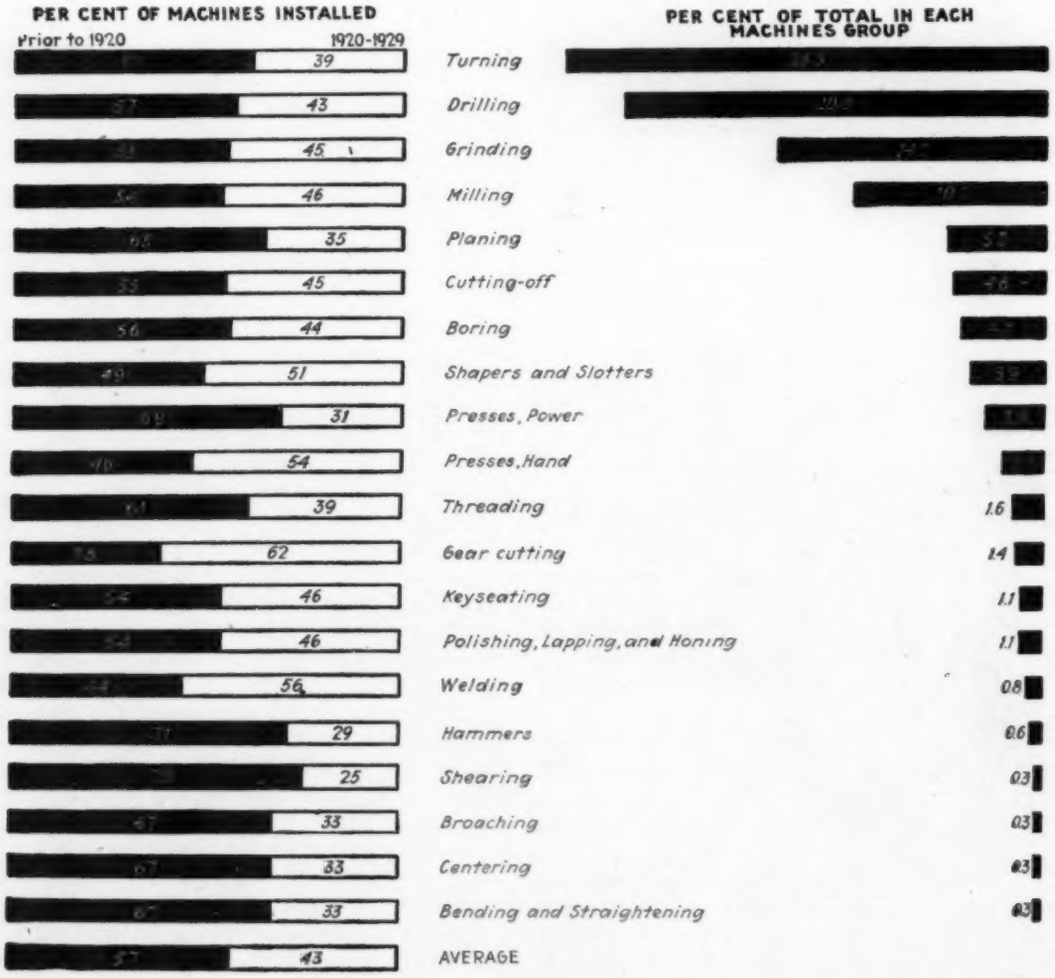
of Metal-Working Equipment

MAKERS of machinery for cutting, boring, or shaping wood, such as boring and mortising machines, lathes, tenoners, molders, planers, matchers, sanders, and sawing machines are covered by this division. Numerically this group is the least important reported thus far, with only a total of 5,142 units of equipment in place.

The 57 per cent of equipment over ten years of age is not comparable with any figure reported in the inventory taken five years ago, since at that time, this division was included with miscellaneous machinery. It is however thirteen points above the 44 per cent average for all industrial groups obtained for the 1925 inventory.

Report No. 21.—Plants making woodworking machinery

Of the equipment groups 72.5 per cent of the total consists of turning, drilling, grinding, and milling machines. Three equipment groups, namely forging, riveting, and wire forming reported for the other industrial divisions were omitted from the summary because of insufficient data. Woodworking machinery is reported separately for the first time in the 1929 Census of Manufacturers.



Machine Tools for Making Woodworking Machinery

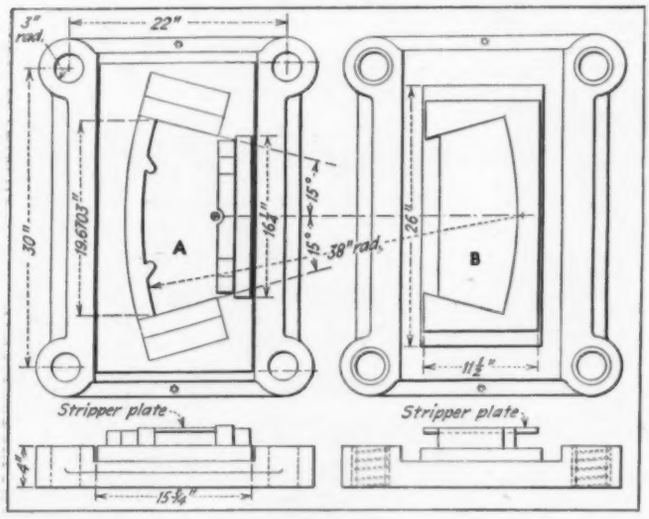
	Total Number in Plants 1930	Number Installed Before 1920
LATHES		
Engine	903	620
Hand Turret	90	40
Power Turret	76	31
Automatic and Semi-Automatic	9	4
Chucking (Not Chucking Machines)	27	13
Speed and Bench	67	36
Toolroom Type	63	18
Other	18	4
CHUCKING MACHINES (Not Chucking Lathes)		
SCREW MACHINES		
Hand	22	13
Automatic, Single Spindle	22	13
Automatic, Multiple Spindle		
CENTERING MACHINES	13	9
MILLING MACHINES		
Hand (No Power Feed)	45	18
Bench	9	
Plain (Knee and Column Type)	301	193
Universal (Knee and Column Type)	94	40
Vertical (Knee and Column Type)	22	4
Lincoln Type Manufacturing	13	4
Continuous, Rotary Table or Drum Type		
Planer Type	27	18
Other	9	4
GEAR CUTTING MACHINES		
Rotary or Milling Type	27	18
Hobbing	35	
Planing or Shaping	4	4
Other	4	4
BORING MACHINES		
Horizontal Boring, Drilling and Milling	90	40
Vertical Boring Mills	135	85
Other		
JIG BORERS		
DRILLING MACHINES		
Radial	157	72
Upright, One Spindle	602	369
Upright, Two or More Spindles	31	18
Upright Gang (Two or More Heads)	4	
Sensitive, One Spindle	157	81
Sensitive, Two or More Spindles	13	13
Sensitive Gang (Two or More Heads)	4	
Two, Three and Four Way		
Other	9	9
THREADING MACHINES		
Single Spindle Tapping		
Multiple Spindle Tapping	18	
Pipe Threading and Cutting		
Bolt Threading and Cutting	18	18
Thread Chasing	36	27
Thread Hobbing and Milling		
Thread Rolling	9	4
Other		
PLANERS		
Open Side	13	13
Double-Housing	256	162
SHAPERS		
Vertical		
Horizontal	193	94
Slotters	9	4
KEYSEATING MACHINES	58	31
BROACHING MACHINES	13	9
GRINDING MACHINES		
Plain Cylindrical	243	184
Universal Cylindrical	36	9
Surface, Reciprocating	54	18
Surface, Rotating	13	4
Internal	27	4
Crankshaft		
Cutter	58	22
Floor, No Feed Attachments	144	81
Bench, No Feed Attachments	63	27
Abrasive Disk	27	9
Abrasive Belt		
Centerless	4	4
Other	63	36
POLISHING AND BUFFING MACHINES (Including those in Plating and other Depts.)		
Abrasive Wheel, Hand Operated	40	22
Abrasive Belt, Hand Operated	9	
Automatic and Semi-Automatic	4	4
LAPPING MACHINES	4	4
HONING MACHINES		
CUTTING-OFF MACHINES		
Parting Tool Type		
Power Hack Saw	193	103
Rotary Cold Saw	22	4
Bandsaw	27	22
Other	4	4
WIRE FORMING MACHINERY		
Spring Coiling		
Other		
WELDING AND CUTTING MACHINES		
Resistance Welding, Butt	4	
Resistance Welding, Spot	4	
Resistance Welding, Seam		
Resistance Welding, Other		
Arc Welding	18	9
Electric Cutting		
Gas Welding	9	4
Gas Cutting	4	4
RIVETING MACHINES, STATIONARY		
Pneumatic		
Hydraulic	9	
Power		
PRESSES		
Punching Machines	13	
Combined Punches and Shears	9	4
Hand, Arbor	85	45
Hand, Light Punch Press Work	22	4
Foot, Light Punch Press Work		
Power, Crank Type	108	85
Power, Toggle Type		
Power, Double Acting		
Power, Dieing Type	4	4
Power, Trimming Presses		
Power, Forcing, Arbor, Wheel	4	4
Hydraulic, Bending, Forming, Drawing		
Hydraulic, Wheel Forcing, etc	18	9
Baling, Power and Hydraulic		
Other		
BENDING AND STRAIGHTENING MACHINES		
Bending Brakes		
Bending Rolls, Horizontal	9	9
Bending Rolls, Vertical	4	
Straightening Rolls		
Other		
SHEARS		
Knife	9	4
Rotary, Slitting	9	9
NIBBLING MACHINES		
HAMMERS		
Drop	18	13
Helve		
Spring		
Steam	9	4
Pneumatic (not portable)	4	4
Other		
FORGING MACHINES		
Bulldozers	4	4
Hot Forging Machines		
Cold Headers, Bolt, Nut, etc.	4	4
Cold, Swaging		
Forging and Flanging Presses, Hydraulic		
Other Forging Machines		
Total	5,142	2,941

IDEAS FROM PRACTICAL MEN

Building Large Press Tools to Close Limits

C. W. HINMAN
Chief Tool Designer, Kobzy Tool Company

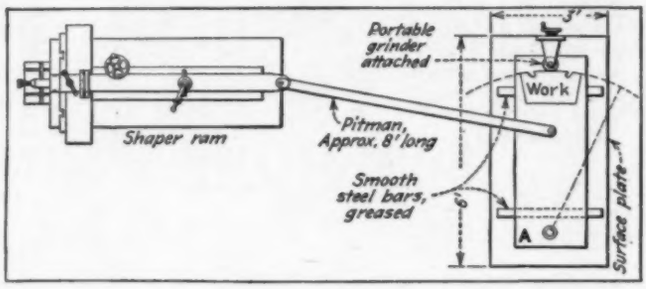
THE PILLAR-PRESS tools shown in plan in Fig. 1 were built for blanking segments for a rotor having a diameter of 76 in. Twelve segments were required for each lamination, there being an insulating gap of $\frac{1}{16}$ in. between the ends. The segments were required to be within ±0.002 in. in both width and radius. Be-



cause the tools were beyond the range of some of our toolroom equipment, there were several interesting problems to solve.

At *A* are the die and the die-holder, while at *B* are the punch and the punch-holder. As can be seen, the die is built up of several sections. The punch consists of two equal parts and is shown surrounded on three sides by its stripper plate. The usual stripper-plate pad, actuated by coil springs from below, is fitted between the cutting edges of the die. Since the punch could not be sheared into the die because we had no press large enough, the cutting surfaces of both the punch and the die had to be made to fit a very accurate templet, the dimensions of which were taken from a drawing of one of the segments. The templet was "nibbled" close to all the lines, and was afterward finished as accurately as possible in a die slotter. The final finish was by grinding, where possible, or by die filing.

Since we had no vertical boaring mill in which we could machine the curvatures on the punch and in the backing-up heel in the die-holder, we rigged up the improvised arrangement shown in Fig. 2 for grinding them. Mounted successively on an oscillating plate, the punch



and the die-holder were ground to arcs of the proper radius. The oscillating plate was pivoted to a large surface plate at *A*. Between the plates were flat bars of steel, well greased, for the upper plate to oscillate upon. The surface plate was mounted on a bench at the proper height, and the upper plate was oscillated by a pitman connected to the rear end of the ram of a shaper, close by.

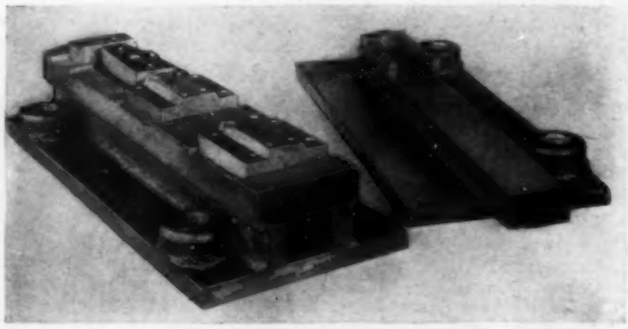
A portable grinder was located in the position shown on the surface plate, its spindle being vertical. The necessary feed screws were, of course, provided. With a 2-in. wheel in the grinder, and with the plate and the work oscillated by the shaper ram, the grinding was accurately done. The work was checked from time to time by gage plugs fitted in holes accurately located in the die-holder and in the oscillating plate.

Arc Welded Die

A. F. DAVIS
The Lincoln Electric Company

In the manufacture of steel dies for punching, cutting, and trimming, the electric arc welding process often permits an advantageous construction, as shown in the accompanying photograph. This die is used for cutting and trimming light gage sheet steel for the legs of a small metal stool. It is 10 in. long, 24 in. wide and weighs approximately 350 lb. The entire die, with the exception of the die blocks and tool steel sections for the end trim, is fabricated of rolled steel shapes joined by the electric arc welding process.

The die is constructed of a piece of 1-in. plate 10 in. wide by 24 in. long to which two bars, 1x2x24 in. are welded, as shown. These bars support a billet,



6x2x24 in., to which the tool steel die blocks are bolted. The punch for this die was also made on a steel plate, 2x10 in. by 24 in. long. A billet, 1½x3x24 in., is arc welded to this piece. The upright steel pieces shown on the end of this billet are pieces of tool steel for the end trim. The guides were made from 4-in. bar stock.

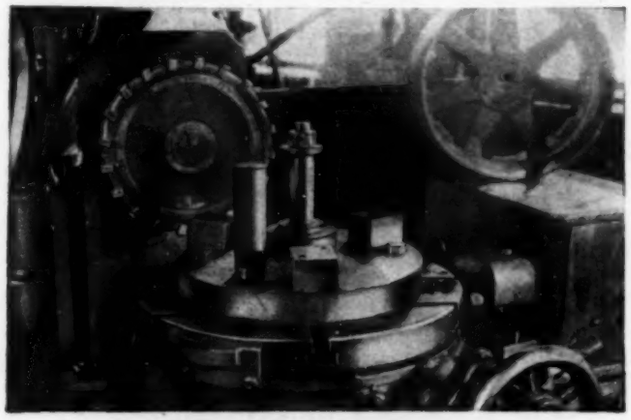
This die was built by the Youngstown Welding and Engineering Company, Youngstown, Ohio. In fabricating this die, welded construction was used in place of cast construction, thus eliminating the time and expense required to produce patterns and to cast and machine the die. The weight of this die was also reduced by arc welded steel construction because of the superior physical qualities of rolled steel over cast steel.

□

Crowning in a Milling Machine

H. P. LEONARD

Finishing a crown-faced pulley on a milling machine sounds a bit far fetched and is not a method that would suggest itself immediately. That it did occur to production engineers of the Clark Equipment Company in Buchanan, Mich., was the result of trouble with another



job. The object in that particular instance was to mill flat faces on parts held in fixtures on a circular indexing table; it was found that the pieces came off slightly bulged. Investigation proved that the center of the spindle and the center of the table did not coincide exactly. From this premise, it was concluded that by deliberately offsetting the indexing table an appreciable amount a decided camber could be obtained on a piece that was continuously rotated.

This is what was done by the pulley job as the illustrations show. The pulley is cast-iron and is used for power take-off on a tractor. Its splined hub is centralized on a vertical stud, and the rim rests upon hardened blocks. Drive is through a stud projecting between the spokes. The cutter is an inserted-tooth face mill, 10 in. in diam., of conventional form. Because the work is finished in one revolution of the table, the production time is only 9 min. as compared with 20 min. when the pulley was crowned on a lathe.

■

Necking for Grinding—*Discussion*

O. D. RICKLY
Assistant Professor of Industrial Engineering, Ohio State University

Referring to Mr. J. T. Towlson's suggestions in *American Machinist*, Vol. 73, page 713, it would seem that the real reason for necking had been overlooked. The writer has always felt that the most important reason for necking was to eliminate the necessity of grinding sharp corners.

In the suggested method, the grinding wheel would have to be dressed to a sharp corner or a small fillet will result which will not permit cutters or spacing collars to come squarely against the shoulder. Such a fillet would also mean the reversing dog on the grinder would have to be set to trip exactly as the wheel touched the shoulder. If it tripped before it reached this point, the piece would not be the correct size near the shoulder, and if it failed to trip just as it reached the shoulder, a broken wheel would result. For these reasons, the method of necking the shaft itself is given the preference, even though it does reduce the cross sectional area a small amount.

■

Machining Tapers

L. F. SWENSON
Industrial Engineer, Perkins Machine & Gear Company

It is not unusual for workmen to have trouble in turning or grinding tapered work. Tapers are dimensioned as a given amount per foot, a given included angle, or by giving the dimensions at the ends in connection with the length on the center line. Taper attachments for lathes, and the pivoted tables of grinders, are usually graduated for tapers per foot only.

Assume that the operator of a grinder has to grind a taper of 10 deg. included angle, and that the pivoted table of his machine is graduated for tapers per foot only. The conversion from taper in degrees to taper per foot is very simple. If the included angle is divided by two, the result will be the angle of the right-angle triangle on one side of the center line, which in this case will be 5 deg. The tangent of 5 deg. (0.08749) is the taper per inch of this angle. Multiplying the tangent of 5 deg. by two will give the included taper per inch. Multiplying this product by twelve will give the included taper per foot, thus: tan 5 deg. x 2 x 12 = 2.09976, or approximately $2\frac{3}{32}$ inches, which is the included taper per foot.

Where the diameters of both ends of the taper and the length of the tapered part on the center line are given,

subtract the smaller diameter from the larger and divide the result by the length on the center line. The result will be the included taper per inch, which multiplied by twelve will give the included taper per foot, thus:

$$\frac{D - d}{L} \times 12 = \text{included taper per foot, when}$$

D=diameter at large end
d=diameter at small end
L=length on center line

In measuring a taper where the dimensions are given at both ends, the problem of measuring the small end is often troublesome. A simple method is to measure the diameter at ¼ in. from the end by keeping the outside of the micrometer spindle, which is usually ¼ in. in diameter, flush with the end of the tapered part. Subtracting the amount of taper in ¼ in. from the micrometer reading will give the diameter. In other words, the micrometer reading will be equal to the diameter of the small end, plus the amount of taper in ¼ inch.

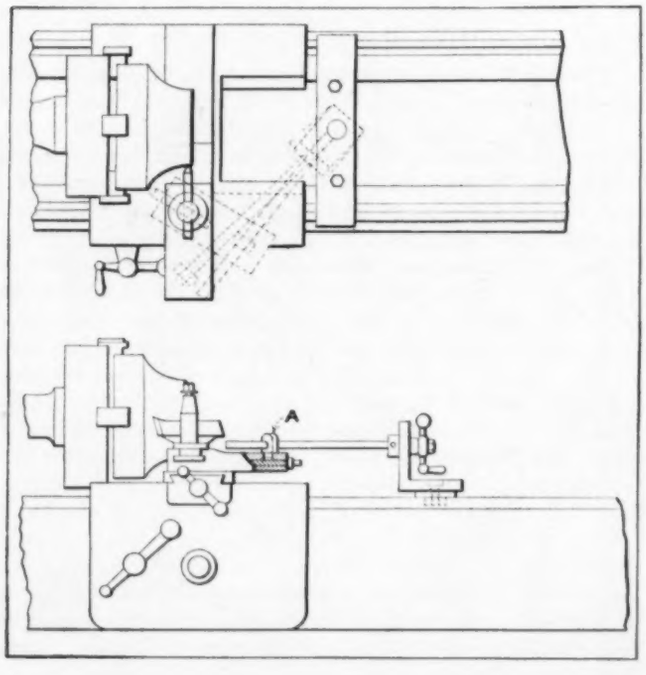
■

Turning a Large Radius

P. L. Budwitz

There are many jobs in machine shops where fillets of comparatively large radii must be turned, such as on flanges, large punches, and similar work. I have successfully used the device shown in the illustration for such work.

The swiveling action of the compound rest is utilized for making the tool follow the desired curve, the radius of which is controlled by the distance the point of the tool is set from the center of the swivel of the compound rest. A feed screw engaging in the swivel nut *A* on the compound rest, and collared in a swivel bearing mounted on a strap secured to the shears of the lathe, is used to rotate the compound rest upon its pivot. The action is indicated by the dotted lines in the plan view in the upper part of the illustration.



Adjustment for radii of different lengths can be made either by the feed screw of the compound rest, or by setting the tool farther in or out from the toolpost. The depth of cut is governed by the position of the compound rest on the bridge of the carriage, and position of the fillet on the work is controlled by the position of the carriage on the ways of the lathe.

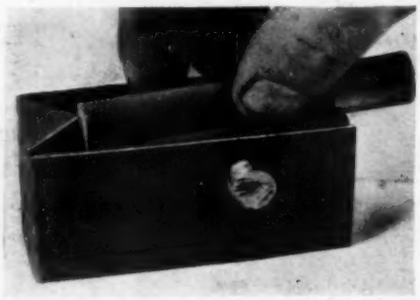
■

Tool for Marking Center Lines on the Ends of Short Rods

Harry Moore
Hamilton, Ontario, Canada

For scribing center lines on the ends of short rods, one of the handiest tools is the swinging V-block shown in the illustration. The V-block is pivoted in a sheet-steel case, and the scribing part of the device is a piece of the end of the case, cut to a point, hardened, and bent down at a right angle.

In operation, the rod to be marked is laid in the V-block with the end touching the marker. Then the V-block and the rod are rocked up and down once, the marker scribing a line on the end of the rod. The rod is then rotated a quarter of a turn in the V-block, and



the operation is repeated, the result being that two lines at right angles to each other are scribed across the end of the rod, their intersection being the center of the rod. The other end of the rod is then treated in the same manner.

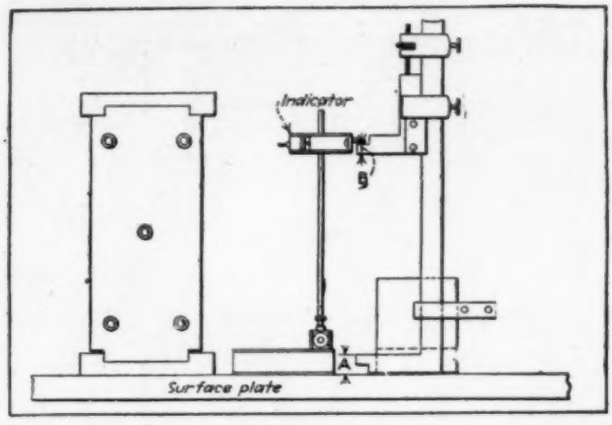
■

Checking Bushing Holes in Jigs

Charles Kugler

In checking the center distances of bushing holes in jigs, when the distances are greater than can be measured by the ordinary height gage, makeshift methods, which are not always reliable, are sometimes resorted to. If a large vernier caliper is available, it can be used for this purpose in conjunction with an indicator mounted on a surface gage, as shown in the illustration. If the vertical rod of the surface gage is not long enough, a piece of drill rod of the necessary size and length can be substituted for it.

The vernier caliper is clamped to the vertical member of an angle plate, and is used to check the center distances of the bushing holes, as determined by the indicator. In setting the caliper to the required dimension, the dis-



tances *A* and *B* must be allowed for, because the dimension shown by the scale is that between the insides of the jaws, while the actual dimension is the distance from the outside of the stationary jaw to the part of the movable jaw used for inside measurements. Likewise, when the holes are not all of the same diameter, half the difference must be added to the reading of the vernier in order to find the center distance. The height, as shown by the indicator, is transferred to the vernier by the method indicated in the illustration.

■

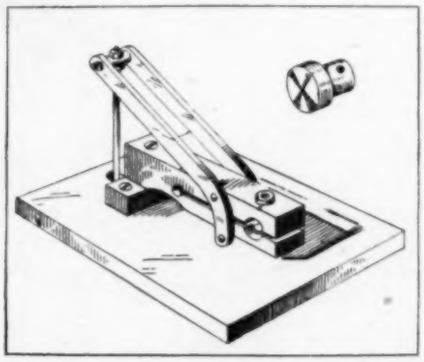
Jig With Foot-Operated Clamp

CHARLES H. WILLEY
Assistant Plant Superintendent, Hoyt Electrical Works

For holding round work for drilling or tapping, the jig with a foot-operated clamp, as shown in the illustration, has proved to be very convenient. The clamping part of the jig is made of a good grade of high carbon steel. It is drilled for the reception of the work and the drill bushing, and is slotted as shown. The lower part is thinned so that it will flex easily. After all the machine work has been done, the clamping part is hardened and then drawn to a spring temper.

The clamping levers are pivoted in the upper jaw and are provided with a roller at their lower ends, the roller bearing on the under side of the lower jaw. A rod connected to a pedal is attached to the outer ends of the clamping levers through a stud pivoted at both ends.

The work with the hole drilled in it can be seen in the upper part of the illustration. Since clamping and releasing are done by pressing and releasing the pedal, both of the operator's hands are free for handling the work.



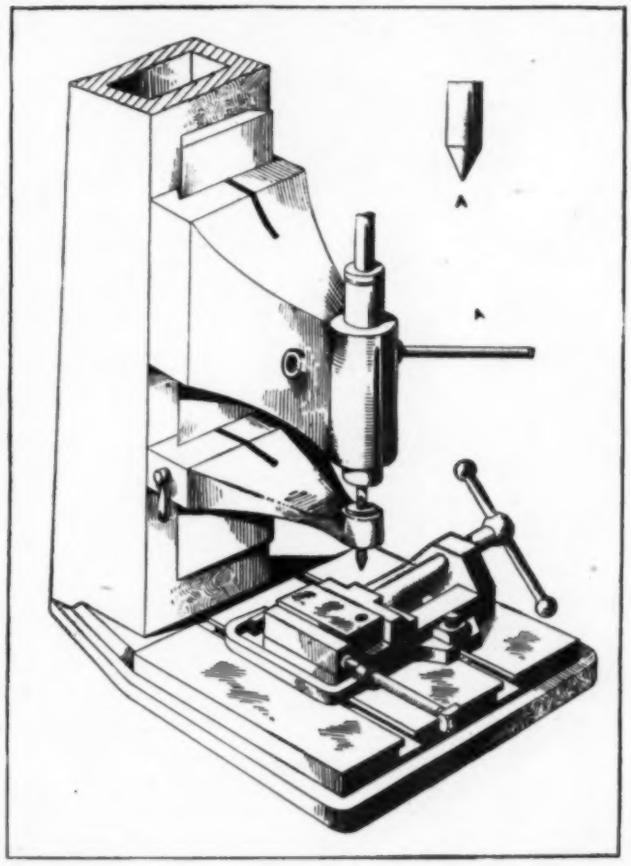
Universal Jig Attachment for a Drill Press

GLYNN WILLIAMS

A very convenient attachment for a drill press having a sliding head is shown in the illustration. It consists of a bracket clamped to the face of the column. A hole is bored in the bracket in line with the spindle of the machine, so that slip bushings can be inserted therein. The bracket can be adjusted to any desired height.

The device is especially useful in drilling work in which the location of the hole is indicated by a punch mark. In such cases, the center *A* is slipped through a bushing in the bracket, and the work is shifted until the point of the center will enter the punch mark. With a drill and a bushing of the correct size in place, the hole can be accurately drilled as to location. There will be no need for scribing a circle around the punch mark and prick punching the circle, as is usually done to show whether or not the drill runs out of center.

For small-lot manufacturing, a drill press equipped with such a bracket as is illustrated, and with bushings



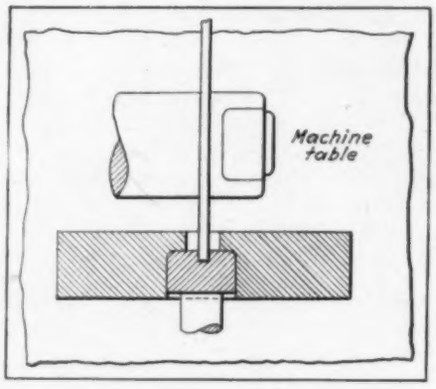
of various sizes, will in many cases eliminate the necessity for making jigs, and will give reasonably accurate results. Various methods of holding the work can be arranged quickly and cheaply. In the illustration, the block clamped to the stationary jaw of the vise by a C-clamp acts as a stop for the work. A V-block clamped to the table, and centered under the spindle by the center *A*, can be used to hold round work for drilling holes centrally.

A Simple Fixture for Slotting Small Screws

GEORGE BELBES
Teletype Corporation

For slotting small screws in quantity lots, we found that a fixture into which the screws must be screwed was too slow in operation, so we made the fixture shown in the illustration.

A piece of cold-rolled steel was drilled and counterbored, the counterbore being a free fit for the screw heads, and slightly deeper than the thickness of the heads. It was blocked up on the milling-machine table, high enough for the screws to be inserted without interference. With the table of the machine set so that the slots will be cut to the desired depth, the screw heads are pushed into the counterbore and against the saw by hand. The bottom of the counterbore acts as a stop to limit the depth of the cut.



Since the saw does not travel across the screw heads, it must be large enough in diameter so that the curvature at the bottom of the slot will not be too great.

■

Fixture for Holding Thin Work

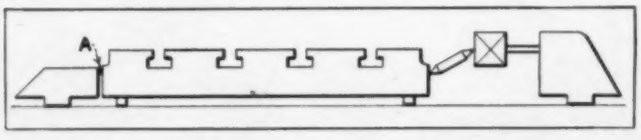
Discussion

C. A. COPPACK
Leicester, England

The method suggested by F. H. Mayoh, in an article under the title given above, on page 213, Vol. 73, of the *American Machinist,* is somewhat misleading. If it is suggested that the fingers will grip the work without swinging down into the solid metal, the method is wrong.

It is quite obvious that the thin edges of the fingers will skid on the thin edge of the metal, sooner than to bite into it. If the fingers were turned upside down, bringing the chamfers upward, and if chisel cuts were made in the edge of the work, in which the sharp edges of the fingers would engage, there is a possibility of some hold-down effect, but not otherwise.

In the illustration is shown a method I have used for



the past twenty years for holding down comparatively thin castings. At the left at *A,* two Woodruff keys are placed between the back stop and the work. The hold down at the right is familiar to all planer operators.

SEEN AND HEARD

●

Engineering Courtesy

A GROUP of foreign engineers were recently touring various German plants. Among the companies offering full courtesy to the visitors was the Zeiss Works at Jena. Now, among the visitors were a number who would have liked exceedingly to carry certain Zeiss optical secrets back to their own country. Being foresighted, they provided themselves with pocket cameras, and as their guides took them through the works they showed their appreciation by taking secret photographs of every step of the process. Very much pleased with the success of their efforts, they completed their tour. Zeiss officials then asked the visitors to view a motion picture of plant processes. Seeking still more information, the visitors accepted with alacrity. After the show was over, they left, mentally congratulating themselves for their cleverness and good fortune. But they did not learn, until they attempted to develop their films, that while they watched the motion picture X-rays had been passed through the projection room. And X-rays, of course, have the same effect on an enclosed photographic film that sunlight has on an exposed one. —*T*

Good Machining Needs No Scraping

A SCRAPED BEARING used to be considered an evidence of careful workmanship. A verbal description of a large European planer not long ago ended with the statement that several hundred hours had been spent in scraping the bed, table, and other bearings to a perfect fit.

A good scraper is an artist in his line. He can take a warped surface and, given time enough, he can make it flat, or he can take a rotating bearing that is not true and make it approximately cylindrical. By a patient cut-and-try method he can make a series of minute hills and hollows approximate a true surface. Many scrapers do remarkably good jobs.

But a scraped fit is always an evidence of imperfect machining and reflects no credit on the machine department. It may be cheaper at times to scrape than to do a first-class machine job. But if the machine equipment is in first-class shape and the operators know their stuff, scraping should seldom be necessary.

Surplus Gear Strength

PERHAPS it doesn't always pay to economize to the limit. When steel gears in lathe headstocks came to be the style instead of cast iron, some designers reduced the face width in proportion to the strength of the new material. One builder, however, wasted money by making the steel gears the same size as the old ones. He has had a surplus of strength ever since; but in these days of T-C cutting tools he is sitting pretty, with mighty little redesigning to do except to boost speeds a bit. —*J.R.G.*

Electroplating Tables—I

TABLE OF ELECTROMOTIVE SERIES

Each element in the table is electrically positive to the element below it and negative to the element preceding it. Based on the normal hydrogen electrode as zero, single potentials of metals increase in a negative direction upward from hydrogen, and in a positive direction downward. To insure the least amount of undesirable electrolytic action, only metals standing close together in the table should be placed in physical contact. Other recent plating information is summarized on pages 715 and 939, Vol. 73, *American Machinist*.

Element	Symbol		Specific Gravity	Atomic Weight	Common Valences	Electro-Chemical Equivalent Grams Per Ampere Second	Ampere Hours Per Grams Deposited
Potassium		K.	0.870	39.10	1	.000406	0.685
Sodium		Na.	0.971	23.00	1	.000239	1.163
Barium		Ba.	3.80	137.37	2	.000713	0.390
Calcium		Ca.	1.54	40.07	2	.000208	1.338
Magnesium		Mg.	1.74	24.32	2	.000126	2.202
Aluminum		Al.	2.70	27.1	3	.000094	2.969
Chromium	IC	Cr.	6.92	52.0	3	.000090	1.544
	OUS	Cr.	6.92	52.0	2	.000270	1.030
Manganese	IC	Mn.	7.42	54.93	3	.000189	1.463
	OUS	Mn.	7.42	54.93	2	.000284	0.975
Zinc		Zn.	7.00	65.37	2	.000339	0.820
Cadmium		Cd.	8.65	112.4	2	.000582	0.477
Iron	IC	Fe.	7.28	55.9	3	.000193	1.439
	OUS	Fe.	7.28	55.9	2	.000289	0.196
Cobalt	IC	Co.	8.72	58.97	3	.000203	1.365
	OUS	Co.	8.72	58.97	2	.000305	0.909
Nickel	IC	Ni.	8.80	58.68	3	.000202	1.371
	OUS	Ni.	8.80	58.68	2	.000304	0.914
Tin	IC	Sn.	7.30	118.7	4	.000308	0.901
	OUS	Sn.	7.30	118.7	2	.000616	0.451
Lead	IC	Pb.	11.4	207.2	4	.000535	0.518
	OUS	Pb.	11.4	207.2	2	.001070	0.259
Hydrogen		H.	0.0695 Compared to air	1.008	1	.00001044	26.60
Antimony	IC	Sb.	6.70	120.2	5	.000249	1.115
	OUS	Sb.	6.70	120.2	3	.000415	0.669
Bismuth	IC	Bi.	9.78	208.0	5	.000430	0.645
	OUS	Bi.	9.78	208.0	3	.0007185	0.387
Arsenic	IC	As.	5.73	74.96	5	.000155	1.790
	OUS	As.	5.73	74.96	3	.000259	1.073
Copper	IC	Cu.	8.90	63.57	2	.000329	0.843
	OUS	Cu.	8.90	63.57	1	.000659	0.422
Mercury	IC	Hg.	13.595	200.6	2	.001039	0.268
	OUS	Hg.	13.595	200.6	1	.002079	0.134
Silver		Ag.	10.5	107.88	1	.001118	0.249
Platinum	IC	Pt.	21.37	195.2	4	.000505	0.550
	OUS	Pt.	21.37	195.2	2	.001010	0.275
Gold	IC	Au.	19.3	197.2	3	.000681	0.408
	OUS	Au.	19.3	197.2	1	.002040	0.136

Melting Points of Metals

	Cent.	Fahr.
Aluminum	655	1,211
Antimony	441	826
Bismuth	266	511
Brass	1,021	1,870
Cast-iron (White)	1,135	2,075
Cast-iron (Gray)	1,222	2,231
Copper	1,115	2,042
Gold	1,065	1,949
Iridium	1,950	3,542
Lead	330	626
Manganese	1,550	2,822
Nickel	1,450	2,642
Palladium	1,500	2,732
Platinum	1,780	3,236
Silver	960	1,760
Steel	1,300	2,372
Tin	230	446
Wrought Iron	1,500	2,732
Zinc	420	788

Metal Contents of Plating Salts

Copper Acetate	31.87%
Copper Chloride	37.07%
Copper Carbonate	55.20%
Copper Cyanide	70.50%
Copper Sulphate	25.40%
Gold Chloride	50.52%
Nickel Salts, single	22.01%
Nickel Salts, double	14.94%
Nickel Hydrate	63.34%
Nickel Carbonate	57.87%
Nickel Chloride	45.30%
Silver Cyanide	80.50%
Silver Chloride	68.20%
Nickel Nitrate	64.98%
Zinc Carbonate	55.25%
Zinc Chloride	47.84%
Zinc Cyanide	55.50%
Zinc Sulphate	22.73%

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Management's Interest in Unemployment

ONE of the most striking features of the present industrial condition is the assumption, on the part of management, of a new responsibility toward its employees. The significant and hopeful feature is that this is not being approached from the standpoint of philanthropy, but as part of the new order of business.

There are wide differences in the ideals of various managers and in the methods employed. Comparatively few concerns have worked out very definite plans or have gone far toward a final solution of the unemployment problem. But the beginnings already made give promise of a real advance over any previous action along this line. The mere fact that management is considering unemployment as a charge against industry, in something the same way as accident compensation, is worthy of note and of congratulation.

There is no better antidote for red, pink or other propaganda than a conscientious following up of the good work already begun. But interest and work along this line must not lapse with the return of better business. Its continuance will do much to prevent another era of widespread unemployment.

Progress Toward Standardization

SOME boast of the progress of standardization of its economies, its accomplishments—others warn of over-standardization, its possible dangers. All should realize how many really basic projects still hobble along without any scientific standards whatever.

Consider, for example, such a basic thing as the finish of a ground surface. A grinder salesman is called in; he accepts an order for a precision grinder "to have a capacity of 200 pieces per hour, ground to an ordinary commercial finish." But what is a commercial finish? Neither customer, salesman, nor grinder engineer has been able to answer this question in a satisfactory manner.

Worthy of more than passing mention, then, is the suggestion of R. E. W. Harrison, in a recent paper before the A.S.M.E., that some method of evaluating ground finishes be adopted, a suggestion which he backs with a method of comparing and calibrating these surfaces, together with practical production equipment for the work. Discussion revealed that other engineers in various parts of the world have been making researches along similar lines in order to avoid present slow, costly, argument-provoking methods. Should Mr. Harrison's ideas gain general acceptance, industry will have trod another of the steps away from haphazard guesswork toward a beneficent standardization.

Salaried Employees Plus

RELIEF PLAN dogs the heels of relief plan. Since it is not yet axiomatic that unemployment relief must be arranged before unemployment sets in, such is inevitable. Their total number and the muddle-headedness of many of them would tax the patience of a congressman running for office.

Thus it is that one hears with joy the plan created by the salaried employees of Continental Motors Corporation. For sheer humanity and, one hopes, sincerity of purpose, it would appear to stand apart.

It seems to have started with the desire of certain salaried employees to share in the relief of distressed wage-earners of the corporation. Acting on their own initiative, this group pledged the payment of a certain sum each month for five months. It was then proposed that other salaried employees join the project on a purely voluntary basis. The fund is administered by a small committee in each plant, empowered to investigate each case of distress and to take remedial action. Employees receiving assistance are given to understand that such entails no obligation and that repayment is not expected.

The results have been so gratifying that the board of directors has now voted to add substantially each month to the fund. Salaried employees, wage-earners, and directors are all to be congratulated. Those who conceived the plan are not common or gardener salaried employees; they are salaried employees plus.

SHOP EQUIPMENT NEWS

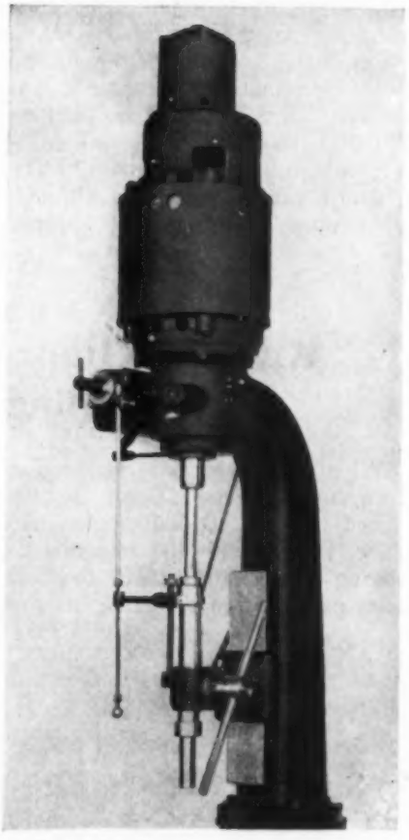
Leland-Gifford Motor-Spindle Drilling Machines

Greater safety and convenience, together with neater appearance, are found in the motor-spindle drilling machines announced by the Leland-Gifford Company, Worcester, Mass. These machines have the motors mounted directly on the spindles with all wiring enclosed in the columns and thoroughly protected from damage by moving parts. Three sizes are built in the following capacities and speeds: No. 1—$\frac{5}{16}$ in. capacity and spindle speeds from 1,800 to 10,800 r.p.m.; No. 2—$\frac{3}{4}$ in. capacity, spindle speeds from 150 to 3,600 r.p.m.; No. 3—$1\frac{1}{4}$ in. capacity, spindle speeds 145 to 1,200 r.p.m.

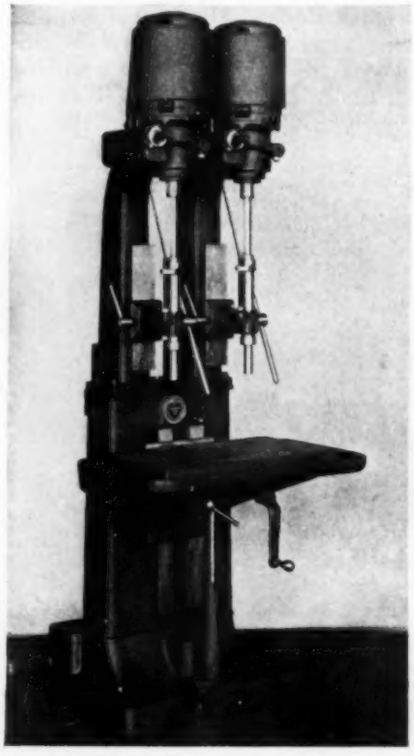
To operate the machine, whether single or multiple spindle, it is necessary only to bring in one set of wires from the a.c. power line through a conveniently placed handhole in the column and connect them to the fuse block, which is placed just ahead of the magnetic contactor. This magnetic contactor, mounted inside of the base, is operated by a treadle at the front of the machine, and through it all spindles can be started or stopped instantly by a slight foot pressure.

Four motor speeds are obtainable by means of a drum-type controller placed conveniently on the side of the head just below each motor and operated from the front of the machine. Four other speeds may be obtained by means of a ball-bearing backgear unit, which is provided for in the design. The backgears are engaged and disengaged by means of a crank handle placed beside the controller handle, and an automatic interlock is provided between this handle and the controller handle, so that the backgears can be engaged and disengaged only when the controller is in the off position

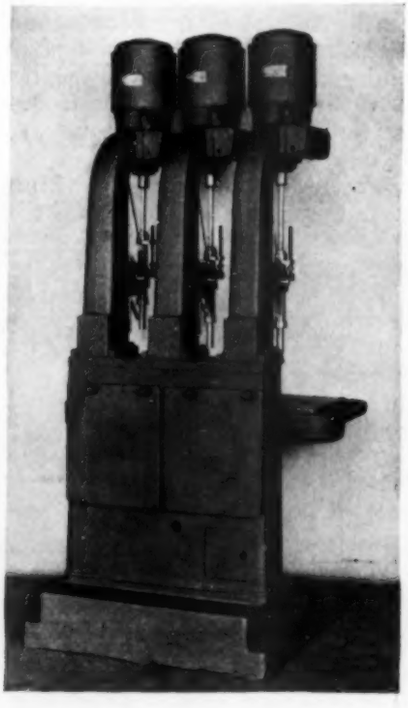
Tapping can be done by mounting a reversing motor on the spindle. Reversal of the motor is accomplished by means of a reversing switch operated automatically by the up and down movement of the



Showing reversing motor applied to Leland-Gifford Motor-Spindle Drilling Machine to permit tapping



Drive is direct from vertical motors above the spindles, and all four of the speeds are controlled by the drum controllers immediately adjacent



All the electrical connections and wiring are completely enclosed in the base and columns of the Leland-Gifford Motor-Spindle Drilling Machines. Openings at the back give access to the magnetic contactors

spindle. Forced ventilation by a motor-driven blower unit keeps the temperature of the motor at a normal operating point at all times.

Coolant is supplied to the cutting tools by a motor-driven pump unit mounted on the rear of the machine and just above the tank, which is cast integral with the base. The coolant is carried to the tools through pipes concealed within the column.

The regular Leland-Gifford semi-automatic return power feed can be applied to these machines, and all machines are so arranged that attachments, such as power feeds, back-gears, and pump units, if not originally supplied with the machine, can be applied in the customer's shop in a few minutes with the use only of such ordinary tools as a wrench and a screw driver.

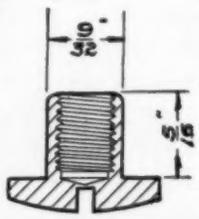


Fig. 4—The part drilled and tapped in the set-up shown in Fig. 3

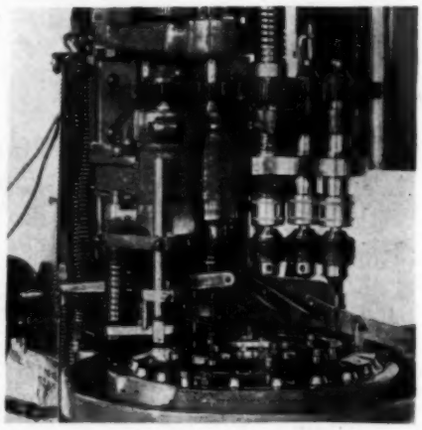


Fig. 3—Mechanism for obtaining positive lead control and giving rapid approach of the tap to the work until within $\frac{1}{32}$ in. of it

Anderson Improved No. 40 Dial Tapping Machine

When the Anderson Die Machine Company, Bridgeport, Conn., first designed the No. 40 dial tapping machine, it was with the intention of placing the tapping of one or more holes per piece on the same basis as

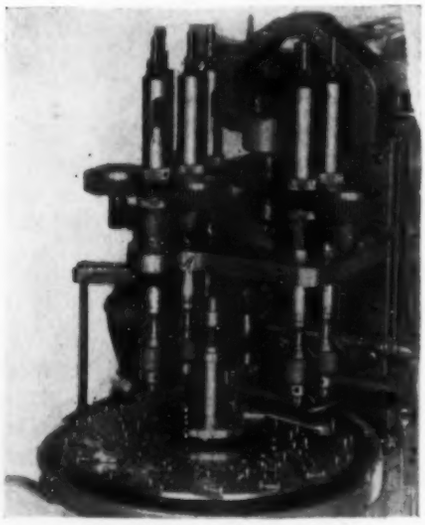


Fig. 1—Anderson Improved No. 40 Dial Tapping Machine with master spindle plate in place on the vertical slide

press operations on sheet-metal parts in dial-feed presses. The improved spindle construction illustrated has been developed for mounting in a master plate, having openings bored to correspond with the centers of the holes to be tapped. Fig. 1 illustrates the spindle master plate in place on the vertical slide of the machine, and also shows a dial for feeding parts for a flush switch having four holes to be tapped with a No. 6 tap—32 pitch. Fig. 2 shows the same machine with the dial in place, but with the master plate and spindles removed. It also illustrates the method of holding down the work during tapping operations. The spindle mounting plate is bored to position the spindles in alignment with centers of holes to be tapped, and must necessarily be machined with respect to the number of teeth in the dial index ratchet and the position of part to be tapped on the dial. This plate is secured to a machined portion *B* on the slide, shown in Fig. 2. The advantage of this construction is that the spindles can be transferred from one mounting plate to another, and the time of setting up is reduced for any particular part. Alignment of the spindles is assured with respect to the holes to be tapped.

The part illustrated as being tapped contains four holes. Six spindles are used in the machine, however, the last two acting as "inspectors" of the two most important holes in the part, in order to assure perfect work. This construction lends itself to a great many forms of work and enables the manufacturer to store the dial and mounting plate for any part while inactive. These plates can be bored to suit any dial on hand, but it is considered advisable to have the dial made at the same time as the plate.

Another arrangement of this machine, as illustrated in Fig. 3, is for drilling holes of limited depth and tapping them in one pass. The line drawing, Fig. 4, illustrates a part drilled and tapped with this mechanism. Depth of tapping is controlled primarily through the use of a crank motion and segment principle of reversing the tap as found on the original design. But supplementing this, a positive lead control is employed directly on the tapping spindle. This mechanism is so designed that the approach of the tap

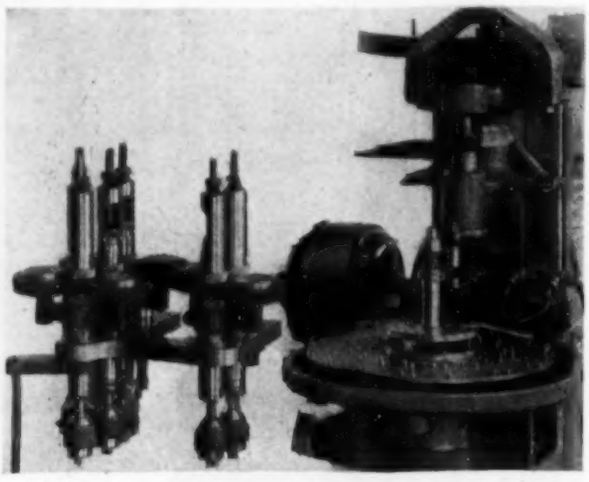


Fig. 2—Master plate and spindles removed from Anderson No. 40 Dial Tapping Machine to illustrate method of holding down the work during the tapping operation

to the work is rapid, until it reaches within $\frac{1}{32}$ in. of the work. Then it is controlled and advances to correspond with the lead of the tap. Similarly, on the reverse it is withdrawn at a rate to correspond with the lead of the tap until entirely free from the work, when it is rapidly removed from interference with the work. As the lead control is placed on the tapping spindle only, it cannot affect any other function of the machine, as for example, the rate of feed of the drilling spindles.

Drilling is done with three spindles placed on the right-hand side. Movement of the third spindle from the right is controlled by an adjustable depth stop, acting independently of the two preceding drilling spindles to assure proper depth under normal conditions. But if hard material is encountered, and in order that the variation in drilling shall not affect the tapping, a mechanism has been applied to gage the depth of the drilled hole previous to tapping. It will stop the machine immediately, should the drills for any reason fail to go to the proper depth. This mechanism multiplies the error and can be adjusted to check the degree of error allowable. This improvement can be applied to countersinking or counterboring, where depth is important. The depth can be controlled to within one or two thousandths of an inch, such as required for the part in Fig. 4.

The part illustrated in Fig. 4 is prevented from turning by means of plungers having fins which enter the screw slots in the head. These plungers are operated mechanically to provide or to compensate for variation in the thickness of the head. Work is automatically ejected and the fixture plunger is cleaned by an intermittent air blast.

This machine will drill and tap these parts at the rate of 1,500 pieces per hour.

Madison-Kipp Air Filer

To its line of small pneumatic tools, the Madison-Kipp Corporation, Madison, Wis., has added the Kipp air filer, which operates at speeds from 500 to 5,000 strokes per min. Kipp files are held by means of a hand-operated collet at the end of the spindle. Many different shaped files are available and can be quickly inserted and removed.

Operation of the tool is similar to the air chipper is described on p. 912, Vol. 73. The pistol grip gives the filer a natural position in the hand, and thus may be held for operation in any position for easy access to any type of work. The air-cushion piston eliminates vibration.

One of the features of this tool is the file guide, which is keyed to the spindle immediately back of the collet and is held in the body by a screw thread. It is octagonal in shape and can be held by the thumb and index finger of the operator's left hand and turned to guide the file over an irregular surface. Turning the guide fully to the right locks it to the body. The tool gives strokes of approximately $\frac{1}{4}$ in., and thus it is also suitable for honing and other operations. Air at pressures from 30 to 100 lb. per sq.in. can be used.

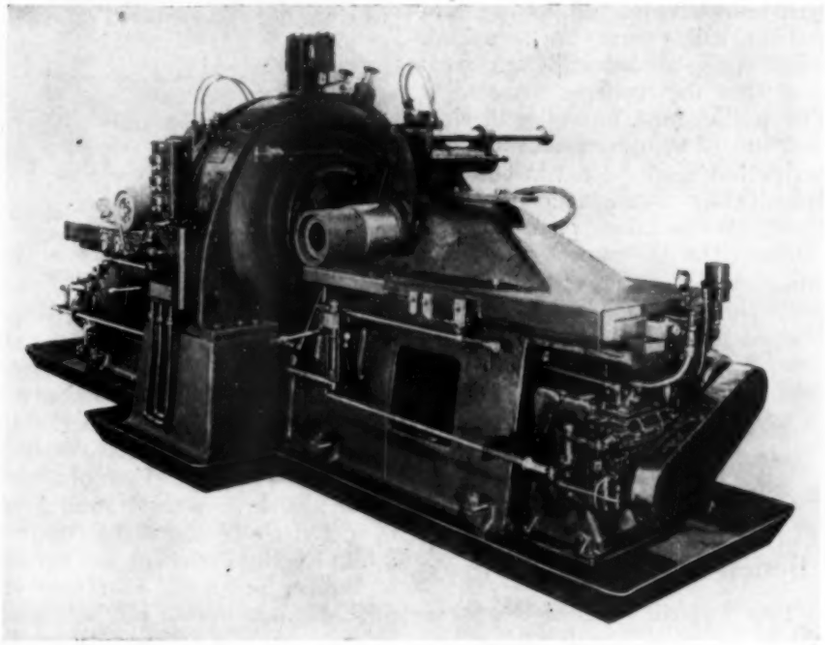
Weighing 1½ lb. and measuring 7 in., the Kipp Air Filer gives from 500 to 5,000 ¼-in. strokes per min.

The weight of the Kipp air filer is 1½ lb., and the length is 7 in.

Stamets Double-End, Center-Drive Boring Machine

Boring and facing pipe couplings and similar tapered and straight bored work can be done on the double-end boring machine developed by William K. Stamets, Jenkins Arcade Bldg., Pittsburgh, Pa. On an 8⅝-in. casing coupling, a total floor-to-floor time of 2 min. has been obtained. During the actual machining, an average of 37 cu.in. of high-carbon steel is removed per minute, with a power consumption of 0.65 hp. per cu.in. per min.

This machine consists of a chuck housing mounted in the center of the bed with a boring carriage



Stamets Double-End Center-Drive Boring Machine equipped for taper boring, recessing, facing, and chamfering couplings for oil-well tubing in one chucking

mounted on each side of the chuck housing. Each carriage is actuated by a separate Oilgear pump and cylinder, providing automatic rapid traverse and two rates of feed. Each carriage is also provided with a delayed reverse, which provides a dwell at the end of the stroke for facing. The carriages run on hardened and ground wearing plates fastened to the bed.

The spindle is 21 in. in diameter and is mounted on two Timken tapered roller bearings, said to be the largest ever used in a machine tool. Incorporated in the spindle is a power chuck, which is opened or closed while the spindle is running by means of push buttons. Chucking pressure is adjustable, but positive means are provided for opening the chuck, regardless of the closing pressure. All moving parts in the chuck housing run in an oil bath, the oil being circulated continuously and pumped through a Purolator, and then discharged into the top of the housing over the spindle bearings.

A 30-hp. adjustable speed motor provides spindle drive through helical gears. The machine is electrically controlled, and the controller equipment provides for automatic speed changes of the motor during the chucking operation. An interlock between the motors is provided, so that if the spindle motor stops the feed is interrupted. A loading arm and unloading arm are provided, which spring automatically into position when the carriages move back. The loading and unloading devices are actuated by compressed air. The boring heads are piloted in bushings placed close to the coupling to be bored. An auxiliary pump supplies cutting oil at the rate of a barrel a minute under a pressure of 100 lb. per sq.in. Oil and chips are discharged through openings in the bed directly into a tank located below the floor line. The entire machine is set in an oil drip pan.

Gray Nos. 00 and 118 Bench-Type Metal Cutters

Two different types of bench machines for sheet metal cutting have been placed on the market by the W. J. Savage Company, Inc., Knoxville, Tenn. The No. 00 is a roller die-type

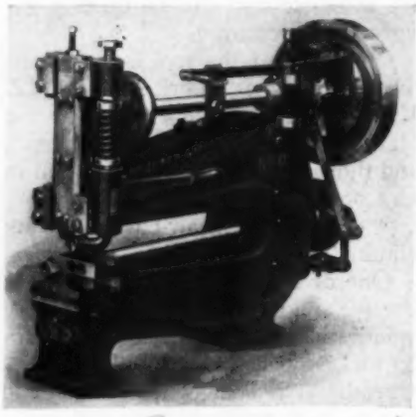


Fig. 1—Gray No. 00 Roller-Die Type Metal Cutter, which has a capacity up to $\frac{1}{8}$ in. in mild steel at a feed of 15 in. per min.

bench cutter, whereas the No. 118 is a nibbling-type bench cutter.

The No. 00 machine has a cutting mechanism consisting of a reciprocating shear blade, which operates continuously when the clutch is thrown in, and a horizontal shear blade, which, with the lower feed rolls, forms a three-sided die. The feed rolls are actuated through an adjustable ratchet feed mechanism, which, in turn, is driven by an eccentric on the shaft

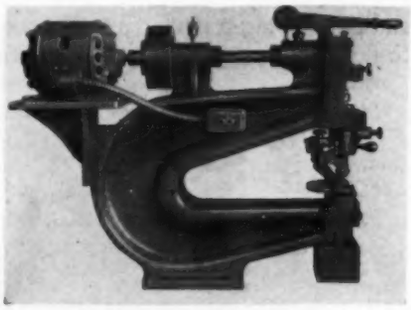


Fig. 2—Gray No. 118 Nibbler-Type Metal Cutter having capacity up to $\frac{1}{8}$ in. in mild steel and a maximum feed per minute of 60 in.

that drives the reciprocating shear blade, thus synchronizing the movement. Circle cutting attachments can be furnished with this machine.

Specifications of the No. 00 machine are as follows: Depth of throat, 18 in.; capacity in mild steel, $\frac{1}{8}$ in., in soft steel, $\frac{5}{16}$ in.; motor required, $\frac{3}{4}$ hp.; length of stroke, $\frac{1}{4}$ in.; number of strokes per min., 350; feed per min., 15 in.; over-all height, 23 in.; over-all width, 7 in.; over-all length, 32 in., and weight, 500 lb.

The nibbler-type No. 118 machine is suitable for line cutting, either straight or curved, and circular cutting. Inside cutting can also be done. With this machine it is possible to change the direction of the cut by turning the tool in the die and without turning the sheet being cut. The turret can be locked in eight positions.

Specifications of the No. 118 machine; Throat depth, 18 in.; capacity mild steel, $\frac{1}{8}$ in.; capacity soft steel, $\frac{5}{32}$ in.; motor required, $\frac{1}{4}$ hp.; length of stroke, $\frac{5}{16}$ in.; strokes per min., 1,200; min. feed per min., 48 in.; max. feed per min., 60 in.; over-all height, 30 in.; over-all width, 10 in.; and over-all length, 41 in.; net weight, 500 lb.

Ohmer Class 800 Tool Crib Register

Losses of expensive tools, jigs, and fixtures are minimized by the use of the tool crib register developed by the Ohmer Fare Register Company, Dayton, Ohio. This Class 800 register offers a mechanical medium for controlling inventory of tools and permits the tool investment to be reduced. It keeps a perpetual tool inventory with a minimum of detail work.

It mechanically prints and issues two original copies of the tool order. Each copy of this tool order shows in printed form the following information:

a. The date (month, day and year) tool was issued to workman.
b. Tool number.
c. Employee's check number.
d. Class of tool.
e. Transaction number.
f. Register number.

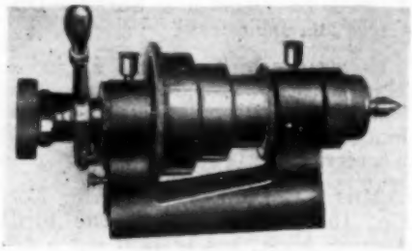
One copy of the tool order is

handed to the workman who signs for the tool issued to him. This copy is then filed by employee's check number and returned to workman when he returns the tool. The other copy of the tool order is filed in the tool card file according to the tool number.

The information printed on copies of the tool order is also printed on the locked-in record of register. This record is filed for future reference and is valuable in tracing tools. The transaction number of this detailed record gives the number of tools issued to employees over any period of time desired.

Hjorth 1¼-Inch Collet Headstock

A headstock having a collet capacity of 1¼ in. has been added to the line manufactured by the Hjorth Lathe & Tool Company, 24 School St., Boston, Mass. This supplements

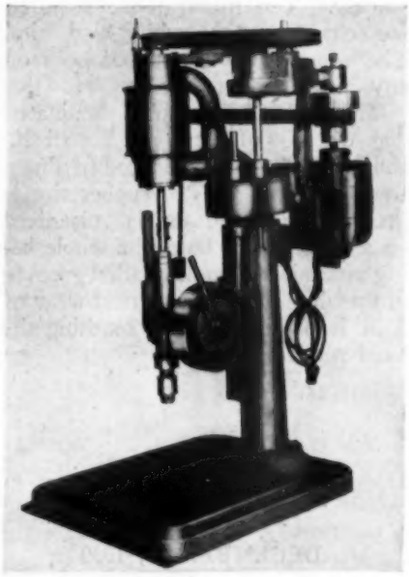


the ⅞-in. size, known as the No. 5 headstock. It can be obtained with a special headstock lever, index for use on the indexed cone rim, or the regular screw tailstock.

Canedy-Otto Sensitive Drill with "C-O-Matic" Power Feed

Both the floor-type and the bench-type 15-in. sensitive drills, made by the Canedy-Otto Manufacturing Company, Chicago Heights, Ill., are now available with the "C-O-Matic" power feed. This device has been developed to provide completely automatic power feed for use with indexing tables, automatic loading devices, or hand-loaded fixtures. Because of the smooth, positive operation of the feed, it reduces operation time, drill breakage, and wear on the machine, and allows the operator the use of both hands.

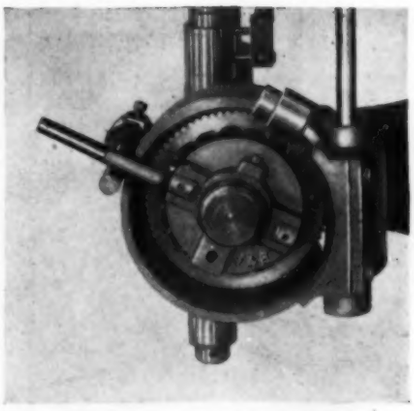
The automatic feed mechanism is mounted in the sliding head and may be moved up and down with it. Three feeds are ordinarily provided through a gearbox with a simple plunger shifter, but by installing cone pulleys for the belt connection to the main



Canedy-Otto 15-In. Sensitive Bench Drill with "C-O-Matic" Power Feed

spindle drive shaft, six or nine feeds can be obtained.

Essentially the C-O-Matic power feed consists of the usual rack and pinion on the spindle quill, with the pinion driven through a friction disk and ratchet clutch by a wormwheel and worm. On the inside face of the hollow wormwheel, projections or teeth are cut at intervals to drive the clutch member by means of a single tooth cammed into position under certain conditions. Fastened to the clutch body is a trip lever, which extends from a slot in the top of the wormwheel case, and which can be used for hand feed. In operation, the trip lever is brought forward by hand until the drill contacts the work. Further movement of the lever cams the tooth into drive position and the spindle is carried down positively until the trip lever hits a depth stop. At this point the tooth is cammed out of engagement and the spindle quill is withdrawn through the medium of a counterbalance and coil spring. In order to provide sufficient



Details of the "C-O-Matic" Power Feed, showing the single tooth clutch and the throw-in cushion

relative movement between the clutch member and the rack-pinion shaft to allow the cam action to take place, the friction disk is incorporated.

For full automatic operation, a throw-in cushion is provided which trips the lever on the back swing and starts the spindle downward again. Semi-automatic operation can be had by simply turning the throw-in cushion to one side. The feed handle must then be reset by hand. For hand feed operations, both the stop bar and the throw-in cushion are set out of the way and a lock pin inserted in the clutch, so that the feed handle is directly connected with the spindle as in an ordinary sensitive drill.

As in the standard C-O sensitive drills, drive of the spindle is by a cone pulley direct from a G-E motor. In the ½-in. capacity drill, spindle speeds are available from 400 to 1,750 r.p.m., or from 525 to 3,000 r.p.m.; in the ⅜-in. capacity, from 1,000 to 5,000 r.p.m.

Pease "Junior" Sheet Dryer

An inexpensive sheet dryer for the production of blueprints and photocopy prints quickly and at low cost, and intended for those who do not require a large machine, has been placed on the market by the C. F. Pease Company, 813-821 North Franklin St., Chicago, Ill. It has capacity for prints up to 24-in. wide and is simple to operate.

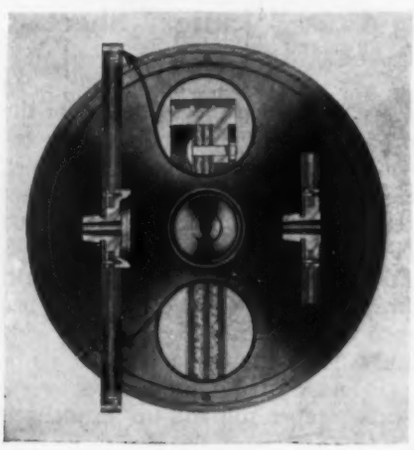
Prints are fed into the dryer over a brass scraper rod and up an inclined

Pease "Junior" Sheet Dryer

feed table, which drains the water away from the drying drum and prevents steam pockets and creased prints. Surplus water is collected in an adjustable drip pan. After drying, the prints are automatically returned to an adjustable tray at the front of the machine, but when especially long prints are being run, the tray can be pushed back out of the way.

The revolving copper drying drum can be furnished with either gas or electric heating elements, and may also be chromium plated, when so specified, for photo prints. The Pease "Junior" sheet dryer is equipped with a ⅛-hp. motor and variable gear drive for two speeds, either 2 or 3 ft. per minute. Over-all height is 5 ft. 3 in., and floor space is 3 ft. 5 in. by 3 ft. 6 in.

Magnified inserts show how Oliver Demountable Rim for Bandsaws employs a live-rubber tire vulcanized into dovetail grooves and also the steel-clad, 5-ply, laminated disk wheel



Oliver Demountable Rim for Bandsaws

A demountable rim for bandsaws has been placed on the market by the Oliver Machinery Company, Grand Rapids, Mich. It may be exchanged rapidly, or the rubber-faced aluminum rim only may be demounted quickly. Ten minutes are required for changing the rubber-clad rim. The wheel can be mounted only on any 36-in. bandsaw.

The steel-clad, 5-ply, laminated disk wheel is of very light but strong construction, and is balanced to afford smooth running. The rubber tire is ground to a circle and is vulcanized on a hard rubber base, the whole being vulcanized into dovetailed grooves in the aluminum rim. Tread wear of ⅛ in. is obtained before reaching the hard rubber.

PATENTS

DECEMBER 23, 1930

Metal-Working Machinery

Jarring Machine. Edward B. Brooke, Birmingham, Ala. *Patent 1,785,998.*

Driving Head for Small Lathes. Harry G. Miller, Denver, Colo. *Patent 1,786,022.*

Railway Journal - Wedge - Grinding Device. Charles Taggart, Detroit, Mich. *Patent 1,786,139.*

Station-Type Drilling and Tapping Machine. Edward P. Bullard, Jr., Stratford, Conn., assigned to The Bullard Co. *Patent 1,786,148.*

Molding Machine. Robert F. Ringle, Zellienople, Pa. *Patent 1,786,171.*

Tools and Attachments

Hand Scraper. Ervin Werner, Brooklyn, N. Y. *Patent 1,785,754.*

Motor-Driven Tool. Theobald C. Weiss, South Bend, Inc., assigned to Electric Sprayit Co. *Patent 1,785,798.*

Tool for Scarifying the Interior of Tubing. Edward P. Kerruish, Cleveland Heights, Ohio, assigned to The Cleveland Graphite Bronze Co. *Patent 1,785,905.*

Mold for Casting Metals. William F. Eppensteiner, Rahway, N. J., assigned to the American Metal Co. *Patent 1,785,941.*

Cutter Tool. Joseph Quinn, Brooklyn, N. Y. *Patent 1,785,978.*

Valve-Centering Device. Harry G. Miller, Denver, Colo. *Patent 1,786,023.*

Tool Holder. John H. Phillips, Chicago, Ill. *Patent 1,786,029.*

Rotary Spiral Splitting Cutter. Fred C. Arey, Oak Park, Ill., assigned to John W. Gleason, Frank W. Bora, William F. Freuenreich, Frederick H. Chetlain. *Patent 1,786,050.*

Chuck. Dudley B. Bullard, Southport, Conn., assigned to the Bullard Co. *Patent 1,786,147.*

Calipers. Jacob J. Young, Buffalo, N. Y. *Patent 1,786,325.*

Furnaces

Electric Furnace. Magnus Unger, Pittsfield, Mass., assigned to General Electric Co. *Patent 1,786,322.*

TRADE PUBLICATIONS

FURNACES, ANNEALING. The Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has released a circular on Westinghouse electric bell-type annealing furnaces in both cylindrical and rectangular forms.

GAGES AND INDICATORS. Frank E. Randall, Waltham, Mass., has issued a supplementary bulletin, as of September 1, 1930, on "Randall & Stickney Dial Gages and Indicators."

GENERATORS. The Troy Engine & Machine Co., Troy, Pa., has issued bulletin No. 602 on generators of the bracket and engine types for d.c. and a.c. service.

MILLS, HOLLOW. The Gairing Tool Co., 1620-1627 West Lafayette Blvd., Detroit, Mich., has brought out a circular describing completely the heavy-duty, adjustable - blade hollow mill recently described in these pages. Complete specifications are given.

MOTORS, INDUCTION. The Ideal Electric & Manufacturing Co., Mansfield, Ohio, has issued Bulletin No. 200 on unit-type Ideal induction motors, showing the construction, giving the specifications, and illustrating the various parts.

PLATING MACHINES. The Meaker Co., 1615-1629 South 55th Ave., Chicago, Ill., has issued Bulletin 313 entitled "Meaker Full Automatic Straight-a-Way and Return Type Plating Machines." Layouts and photographs of the equipment are given, together with the reduction in plating costs.

OIL BURNER, LOW-PRESSURE. Ryan, Scully & Co., Philadelphia, Pa., have available bulletin No. 4H on the R-S Model D1 low-pressure automatic oil burner for use with heat-treating furnaces. This equipment was described in these pages recently, but the present bulletin covers more completely the design and operation of the equipment. It also shows the mounting arrangements.

NEWS OF THE WEEK

Bullard Company Announces Deferred Payment Plan

THE Bullard Company, Bridgeport, Conn., has announced a deferred payment plan for the purchase and installation of modern equipment. The plan is a result of a general study of the purchase, use, and earnings of machine tool equipment and the general average of savings earned thereby over previous and obsolete types of equipment for the same purpose.

The company recognizes that, in the general opinion of industry, two years is the accepted period for such earnings to justify the cost of the change, and by varying this under the conditions existing in the individual case, an equitable division of earnings forms an essential part of the plan. Primarily, the returns effected by new equipment are in relation not only to the performance of the machinery installed but also in relation to the volume of production required by the business at hand and anticipated during the period of deferment, so that a rational figure of agreement may be set arbitrarily as an approximation of reasonable payments, both in size and in time.

The plan includes a first payment of sufficient size to assure protection to the company and to represent an avowed intention on the part of the purchaser. Under the varying conditions that may be encountered, the plan includes a flexibility sufficient to cover the extreme cases. In some cases individual installations justify the investment by the earnings made within a few months, and in other cases where machines have been purchased as a mechanical device essential to the method required by the work, yet offering only limited savings on the normal volume of work, sufficient earnings would be accumulated only over a period of several years. However, both extremes may be represented in the period of deferment and the actual economy worked out in each case.

In approaching such negotiations, the Bullard Company offers for consideration its standard equipment and a study of the work involved, so that future earnings may be approximated. On the other hand, the customer offers for consideration not only the work for which the machine is intended, but an approximate volume indicating how much may be expected from his position in the industry and his market during the period of time required for payment.

According to the company, this plan is not presented so much from an attitude of "selling" in an attempt to force its equipment on to the market, but from an attitude of offering a plan whereby such industries as deserve the benefit may be assisted in alleviating the present conditions of obsolescence in metal-working equipment. The turning current in the cycle of business at the present time is said to furnish particularly favorable conditions under which to inaugurate such a policy.

The European Situation As It Is Today

An abstract of a statement by Dr. Julius Klein, Assistant Secretary of Commerce

INTRA-EUROPEAN trade barriers still continue to present a major obstacle to general European recovery. From a quarter to three quarters of the commerce of each Old World nation is with its immediate neighbors. This accounts for the evident disappointment among trade leaders everywhere over the failure to make much headway of late toward simplification of import quota restrictions, of customs procedure, or anything approaching a tariff truce. There is indeed a distinct indication that European business leaders have become thoroughly wearied of the jockeying of pseudo-economic ententes and alliances for obviously political purposes.

Indeed, the much hoped-for contribution toward greater economic accord through the international cartel, so prominent a feature in the European business scene in the past few years, has unmistakably waned during 1930. This is probably due in part to the over-zealous expectations of those who regarded the cartel as a complete panacea for the ills of business Europe. In some cases also there has been an increasing suspicion among interested business men that the international cartel was not entirely beyond the scope of ulterior political aspirations on the part of the leaders of some member-nations.

In spite of the numerous dark clouds hovering over the scene, it is interesting to know that an increasing number of enterprising American traders have been able to seek out profitable markets even during the dark months of 1930. This would seem to give evidence once more of the futility of sweeping, all-inclusive generalizations as to the total despair in the business situation. Obviously, the answer to the query as to "How's Business?" is contingent on what the business is and where it is. There are prosperous spots and trades even in sorely tried Germany or Britain.

"Electric Capscrews"
Welding up a drill jig body at the Milwaukee plant of the Kearney & Trecker Corporation

One striking feature of the trade situation from our point of view is the constancy of the American share in European commerce. In almost every single case, the percentage which we enjoy of the trade of the Old World nations in both directions has held steadily in spite of bitter agitation regarding tariffs, immigration, War debts, and other issues. In other words, figures as to declining values in our commerce by no means tell the complete story, since such declines are almost universal. It is the factor of our relative status in the whole picture of the trade of any given nation, and therein we have not suffered to any degree, and have on the contrary improved our position in many instances.

There is almost universal concern throughout Europe regarding Russian dumping, not so much on account of the volume, as the apparent irresponsibility with which the given traffic has been carried on. Several of the leading countries are, of course, heavy consumers of Russian raw materials, so that except for the traders involved there is little concern over any price cuts incidental to the Russian operations. There is, however, a fear that the evident irregularities and excesses of the present raw material dumping might be a foreboding of similar operations with industrial wares if the Soviet program of large scale industrial expansion is ever materialized.

Improved Gearsets, Some Free Wheeling, Featured at New York Auto Show

IMPROVEMENTS in gearsets, some of which include a free-wheeling device, are the outstanding developments in cars exhibited at the automobile show which opened in New York on Jan. 3. There is a marked trend toward helical gears, which were not used in any American gearset a year ago, but are now employed in a considerable number. Pierce-Arrow has dropped the herringbone type, now used only by Reo, and several makers have chosen the helical type in preference to the straight-tooth internal type popular a year ago. Strangely enough, Packard, Cadillac, La Salle, and Buick are among those still using straight spur gears, but it would not be surprising if at least the last three of these go to helical types as they are now being used by Oakland and Olds in the Synchromesh gearsets made under General Motors patents and used on the three highest priced General Motors cars. Marmon and Pierce-Arrow are among the makers who have dropped four-speed sets in favor of three-speed types, but Packard, Graham, Peerless, and Chrysler retain this type on some models, the last two continuing their internal gear jobs.

Free-wheeling is now applied to all Studebaker, Pierce-Arrow, Lincoln, Hupmobile, and Auburn models and is quite likely to be used by others later. All of these except Auburn use virtually the same design, involving a roller clutch, but Auburn has another type placed just back of the gearset, operated by a separate lever, and affecting all speeds.

All helical and herringbone gears are constant-mesh types, as are also the Synchromesh designs, so that shifting into the two top speeds is done by a light positive clutch. This makes shifting easier, and when used with a free-wheeling device, the shift between the two top speeds can be made either up or down without declutching.

Several new eights and a few new sixes were exhibited for the first time, but the engines were conventional in design. Marmon's sixteen-cylinder model was the only new engine of more than eight cylinders shown. Other makers are expected to offer twelves before another show comes around. Marmon has equipped a new factory unit for building the sixteen, which has a 30-deg. V aluminum engine with inserted steel sleeves. This car is to sell for less than $5,000.

At the other end of the price scale is the New Mathis four, a diminutive car following closely the design of the French car of the same name, but adopted to American manufacture by Durant engineers. Standard equipment includes shock-absorbers regulated from the dash. Slightly larger than the American Austin, the Mathis is to sell for $445 at the Lansing factory, where preparations for its production are said to be in progress. Much skepticism persists as to the possible market in this country for this general type of car.

Chassis refinements are numerous but not especially striking. There is, however, a marked trend toward the use of rubber mountings for many units, including bodies and springs. Rubber-bushed shackles and shock-absorber links, so arranged that distortion of the rubber takes up all play, are used on many cars. These bushings not only serve as cushions against shock but eliminate the need for lubrication at the points of application.

There appeared to be fewer cars with radiator shutters, but a large proportion are fitted with chromium-plated radiator screens or grills used primarily for ornament. In some cases the grills are inclined to be "cheap looking," but many are decorative and appear as if built-in rather than being added as an afterthought. A few are made in one piece with the radiator shell, the openings being slots which extend either vertically or horizontally and form quite complicated stampings.

Radiators are further embellished with center strips of bright metal and on at least one car corresponding strips are used on head and side lights. This bright work, combined with that on other ornamental parts, such as single-bar bumpers and metal-tire covers, now popular, should keep chromium platers busier than ever.

Stiffer frames are in evidence again. Some have X-shaped bracing, some tubular, and others a variety of formed cross-members. In at least one case, a plate-like cross brace is bolted between engine and gearset. Most engines have four-point mounting on rubber supports.

Many new and striking body designs are in evidence, the trend this year being decidedly along the lines of the popular Cord design of last year, although no other maker has a front-wheel drive. The tendency is toward a pointed radiator slightly narrowed at the bottom, where fender lines are swept in sharply. Fenders are long and heavily crowned and in some cases the outer edge is curved under, adding stiffness and giving a heavier appearance without material weight addition.

The trend toward lowness continues, but headroom is not further sacrified in most cases, the gain being made by dropping the frame and kicking it up over both axles. Smaller wheels, some of them with drop-base rims, also lower the car and further decrease road clearance. Pierce-Arrow is using a spoked wheel pressed from "stainless steel" by Budd.

There is a tendency to make body panels deeper and to narrow windows a corresponding amount. Windshields are tilted and some bodies have rounded corners and are otherwise designed to reduce wind resistance. External visors, when used, are short and are kept close to the glass. Interior visors are fitted on many closed cars. Inside hood latches and concealed radiator filler caps are popular.

Extensive lines of trucks are presented by many manufacturers. These show a marked trend toward smarter appearance, which has become a decided sales asset in the truck as well as in the passenger car field.

Foundrymen to Meet In Birmingham

The A.F.A. Southern Regional Meeting, to be held in co-operation with the Birmingham district foundrymen and allied industries, will be held in Birmingham, Ala., on Jan. 20-21. Headquarters will be established at the Tutwiler Hotel, Birmingham. This is the second of the A.F.A. Regional Meetings, the first being the Quad City Foundrymen's Association Regional Meeting in March, 1930, at Moline, Ill.

The first morning session will be on "High-Test Cast Iron and Cupola Practice," with J. T. MacKenzie of the American Cast Iron Pipe Co., as chairman. The afternoon sessions will be on "Practical Sand Control," "Foundry Costs," and "Fundamentals in Determining Costs of Casting Production." The meeting dinner will be held that evening, and the following day will be devoted to visitations to 32 plants.

French Metal-Working Industry Reflects World Conditions

By Our Paris Correspondent

THE French industrial situation shows, more than ever, a reflection of world tendencies and conditions, stabilized, as one French authority has put it, "on a very unsatisfactory basis, with no immediate prospect of amelioration." The one remedy admittedly lies in finding some means of attenuating the financial crisis.

French industrial production was valued at 140,000,000,000 francs in 1929, a figure greater than that applying to agricultural products. The industrial index was, moreover, in advance of that of 1929 by 4 points in the first six months of 1930, in spite of depressing influences.

Commercial foreign exchanges show a deficit, as they have for some months past. Most disquieting is the increase in imports of manufactured products and a diminution, likewise, in finished products exported—a loss to France "both coming and going."

Monthly production of pig iron has increased continually, as of steel, though at the beginning of 1930, manufactured products, based on these monthly averages, had already begun to show *defaillance*. The automobile industry is still marking time, though the advance selling is already open. There seems every possibility of a big drop in output for the coming year which will leave a gap before what is considered the economic minimum of 250,000 cars of French production is reached. It goes without saying that the used car market, as it is developing, is affecting increased output of new product. Similar conditions apply to bicycle and bicycle parts production in the St. Etienne district, which has continued on the basis of a mild prosperity ever since the war. The bicycle is one of the rare manufactured articles in France whose price has remained at not more than two and a half times the pre-war price, though the wage scale in the industry has a coefficient of five.

In addition to the fluctuation in imports and exports of machinery and tools during the first nine months of the year, referred to last month, a similar situation is found with respect to hoisting machinery. In spite of the growing use of hoisting and conveying accessories in modern plants, during the present year France bought more than double the tonnage abroad that she exported, leaving the home market for what obviously must be a higher priced product. The same observation applies to most of the machinery and tools now turned out.

France has shown a falling off in the tonnage of its exports of electrical machinery from 85,800 quintals in 1928 to 64,700 quintals in 1929, representing 106,800,000 francs and 84,600,000 francs respectively. France holds fifth place among Europe's exporting countries in this line. The Franch labor situation is growing befogged. Heretofore when world unemployment statistics have been compiled, the figures for France were microscopic due to the variance of such figures as tabled locally.

Opinion is that French unemployment will increase at the rate of 1,000 a week until stabilization is reached, at least through the winter. Industries working on short time are becoming more and more numerous. The metal-working industries about balance as to offers and demands for work, above all in the specialist grades.

The anomaly of a comparative lack of unemployment and the also equally apparent short-time and over-time operations in certain industries are some of the things which are tending to fog the real state of economic and industrial affairs. Following the Washington Convention of 1919, France put the 8-hour day law into operation in 1920. It applies throughout all industry, with the usual stipulations and derogations as to overtime. According to a decree of April 2, 1926, such derogation, without limitation, could be applied throughout the metal industries, producing goods which might be of interest or value to national safety and defense. The Ministry of Labor and the Ministry in whose department the special work applied were powered to arrange the necessary exemptions.

What has happened apparently is that a stretch of the imagination and a too liberal interpretation has made almost anything appear in the role of a safety or defensive element for the country's good. Labor inspectors have been instructed to call industry's attention to the fact that special exemptions will only be granted henceforth if the work for which they are paid appears to be of public interest, and, if it's completion in short order is absolutely necessary, adequate evidence of this is to be required.

It is believed that this will remove an element of unhealthy competition where one of two similar industries working side-by-side is running short-time and the other over-time.

Coincident with the above official statement, the National Committee of Federal Metal Workers asks for the abolition of the privilege granted industry of one hundred hours over-time during the year. The committee suggests that there is no justification for this over-time credit today, and because it cannot be supervised closely in practice it constitutes in reality a method of evading the 8-hour day regulation.

WHEN EAST MEETS WEST

Two new machine tool salesrooms, one from the "Far West," the other from the "Far East." At the left is the new building of Roku-Roku Shoten in Tokyo, Japan, at the right the doorway to the Herberts Machinery Co., Los Angeles

BUSINESS ITEMS

Eighteen carloads of mining machinery, purchased from the Mine & Smelter Supply Co., the Dorr Co., the Ruth Co., A. R. Wilfley & Sons, and the Colorado Iron Works, all of Denver, Colo., recently left that city en route to New Orleans for shipment to Bella Vista, Peru, where the equipment will be installed by the Cerro de Pasco Copper Corporation. It was the largest single shipment of machinery in Colorado history.

The Lummus Co., with an authorized capital stock of ten million dollars, has been organized to take over the business of the Walter E. Lummus Co., Boston, Mass. The Superheater Co., and The Babcock & Wilcox Co., hold substantial blocks of stock in the new firm. Officers and directors are: President and treasurer, Walter E. Lummus; vice-president and secretary, Raymond R. Collins.

General Controls Co., Ltd., Oakland, Calif., has started the manufacture of automatic fire and pressure controls for gas and oil burners at 241 10th St., 3,375 sq.ft. of floor space have been leased, and the products, which are sold under the trade name of "General" are being distributed to points throughout northern California. W. Ray is the owner and inventor, and W. T. Ahstrom is the sales manager.

The Hein-Werner Motor Parts Corporation, Waukesha, Wis., has purchased the Mueller Engineering Works of Racine, Wis., according to Gothart Hein, President. Equipment of the Racine plant will be installed in the Hein-Werner plant at Waukesha. J. J. Mueller and D. J. Mueller will join the engineering staff of the Hein-Werner Co., which will manufacture a complete line of jacks.

A new Ford assembly plant will be built at Seattle, according to a recent announcement. Cost of the plant, including site, building, and equipment, will be several million dollars and will employ 2,000 men.

The Morse Chain Co. will occupy Booth B-102 at the American Road Builders' Association National Convention in St. Louis. D. M. McSpadden and H. G. Bates will be in charge.

The Ludlum Steel Co., Watervliet, N. Y., is altering its mill extensively, enlarging the equipment for wire drawing, centerless grinding, heat-treating, and other finishing operations and rolling facilities for special shapes are being extended to supply the demand for non-corrosive steel, according to H. G. Batcheller, President. The carrying out of this program will entail considerable concentration of tool steel production at the Dunkirk mill.

The Detroit Power Screwdriver Co., has removed its office and factory to 5365 Rohns Ave., Detroit.

Concentrating upon one trade-mark, Aluminum Industries, Inc., Cincinnati, Ohio, announces that all products manufactured there and at the Diamond division, at St. Cloud, Minn., will carry the trade-mark "Permite" after Jan. 1. Heretofore the output of both plants has been marketed under the dual name, "Permite-Diamond."

The Northern Pacific Railway has awarded the Pacific Car & Foundry Co., Seattle, Wash., a contract totaling $500,000 for fabrication of steel side sills and cross members for the framework of 1,000 refrigeration cars to be re-built in the Northern Pacific shops in South Tacoma, Wash. The work requires 3,500 tons of steel parts and 800 tons of casting, all to be fabricated in the Pacific Car plant in Renton, Wash.

The Controlador Corporation, recently organized in Oakland, Calif., for the manufacture and distribution of a patented all-metal device for opening and closing garage doors, has established offices at 3734 Hopkins St. The corporation is capitalized at $100,000. E. A. Hansen is president. Associated with him are George B. Davis, Lloyd Brown, and E. D. Woodside.

The Dominion Engineering Works is now actively engaged in utilizing part of the space previously used for the manufacture of paper making machines for the production of other machinery with better prospective demand. The production of steam shovels is understood to constitute part of the new schedule.

A change has been made whereby General Motors Products of Canada. Ltd. (Truck and Coach Division) becomes General Motors Truck & Coach, Ltd., with H. H. Henchel as president and general manager and with head offices and factories at Walkerville, Ont.

Units of the Union Carbide & Carbon Corporation, New York, whose products are used in the main for oxy-acetylene welding and cutting, are to market their products through the Linde Air Products Co., effective Jan. 1. Products affected by the change include Linde oxygen, Union carbide, Prest-O-Lite dissolved acetylene, and Oxweld, Prest-O-Weld and Purox apparatus and supplies.

The Bayne Culvert Co., Quincy, Ill., recently incorporated, has leased factory quarters at Second & Jersey Sts., and will be ready to start production within 60 days. George G. Bayne is active head. Associated with him are E. LeRoy Stocker, Macomb, and Louis H. Menne.

The De Sanno Foundry & Machine Co., 2941 East Twelfth St., Oakland, Calif., is occupying new and larger quarters at 1919 Peralta St. The new building is constructed of brick and will give 10,000 sq.ft. of working space. F. L. De Sanno is owner and manager.

A plan of consolidation will be presented to the boards of directors of the Fageol Motors Co., Oakland, Calif., and the Moreland Motor Truck Co., Burbank, Calif., during the early part of this month, according to a joint statement by L. H. Bill, President of Fageol, and W. L. Moreland, Vice-President of the Moreland company.

Black & Bigelow, Inc., 551 Fifth Ave., New York, has changed its firm name to A. A. Bigelow & Co. Inc., as of Jan. 1. Archibald Black has resigned as president, but will continue his association in the capacity of consulting engineer, and A. A. Bigelow has become president to succeed him.

PERSONALS

E. S. Black, formerly with the American Manganese Steel Co., in the sales department and as assistant to the president, has been made research engineer for Pettibone-Mulliken, Chicago.

William A. Boesche, President of the National Association of Ornamental Iron, Bronze & Wire Manufacturers, estimated in his annual summary and forecast the approximate volume of gross business $250,000,000 in ornamental iron work during 1930 despite the unusual decline in building. Mr. Boesche expects a much better 1931 and greatly increased use of ornamental metals because of the current changes in building design and construction.

W. E. England, formerly chief engineer of the F. B. Stearns Co., Cleveland, has been added to the engineering staff of the Houde Engineering Co., Buffalo.

A. D. Engle, formerly sales engineer of the New York office of the Austin Co., Cleveland, Ohio, will be in charge of the new Boston district office of the company at 809 First National Bank Bldg., 1 Federal St.

Joseph A. Frantz of the American Rolling Mill Co., Middletown, Ohio, has been named a director of the Buckeye Steel Castings Co., Columbus, Ohio.

Major W. E. Hoke and A. Morris Thomson will speak on "Utility of Special Thread Forms" at the Jan. 22 meeting of the Waterbury Local Section, A.S.M.E.

Edward N. Hurley has been re-elected chairman of the board of the Electric Household Utilities Corporation, Chicago, formerly the Hurley Machine Co. Other officers include: President, Edward N. Hurley, Jr.; vice-presidents, Myer Hurley, John T. Hume, and R. S. Chamberlain; vice-president and secretary, James A. McCoy, and treasurer and assistant secretary, John Proudfoot.

Roland N. Jessop has been appointed assistant sales manager, effective Jan. 1 of the Ohio Electric Manufacturing Co., 5900 Maurice Ave., Cleveland, Ohio.

C. R. Messinger, President of the Chain Belt Co., Milwaukee, Wis., has been elected to the presidency of the Oliver Farm Equipment Co., as of

Jan. 1, according to an announcement by J. D. Oliver, chairman of the board of directors of the Oliver company. Mr. Messinger and W. C. Frye of Milwaukee were elected to the board. Mr. Messinger has been active in the management of the Chain Belt Co. for the past 14 years. He has been chairman of the board of the Sivyer Steel Casting Co., Chicago, vice-president of the Federal Malleable Co., Milwaukee, and a director in those firms and in the Interstate Drop Forge Co., Milwaukee, and the Stearns Conveyor Co., Cleveland.

C. W. Obert, Consulting Engineer of the Union Carbide & Carbon Research Laboratories, Long Island City, New York, will lead the discussion on, "Proposed Specifications for Fusion Welding of Unfired Pressure Vessels," at the joint meeting, on Jan. 22, of the Metropolitan Section, A.S.M.E., and the local section of the American Welding Society.

T. S. Fuller, Metallurgist, General Electric research laboratories, Schenectady, N. Y., will discuss metallurgical problems of the electrical manufacturing industry before the New York chapter, A.S.S.T., on Jan. 12.

F. W. Peek, Jr., has been appointed chief engineer of the Pittsfield, Mass., works of the General Electric Co., according to a recent announcement by

E. A. Wagner, manager of the works. Mr. Peek succeeds Guiseppe Faccioli, who retired from active participation a few months ago because of ill health. Mr. Peek was previously consulting engineer.

Leon V. Quigley of the Bakelite Corporation, New York City, will speak on, "Engineering Factors Involved in the Replacement of Metals by Synthetic Resins," at the Jan. 15 meeting of the Worcester Local Section, A.S.M.E., at the Hotel Aurora, Worcester, at 8 o'clock.

Charles Trumper, formerly superintendent of the Dominion Steel Products Co., Ltd., Brantford, Ont., and recently with the Crown Electric Co., has sailed for Russia where he will supervise the erection of a large steel rolling mill.

S. Wells Utley, Vice-President and General Manager, Detroit Steel Casting Co., was recently re-elected president of the Michigan Manufacturers' Association.

E. Walcher, Manager of Operations of the Eastern Division at Eddystone, Pa., of the General Steel Castings Corporation, has resigned. H. E. Rogers, formerly at the Granite City, Ill., works will succeed him. F. C. Henke, Mechanical Superintendent, and J. P. Begley, Chief Metallurgist, also have resigned.

H. A. Weeks and Guy B. Hazelgrove have been appointed receivers for the Cardwell Machine Co., Richmond, Va.

Merritt P. Whipple will become president of the newly organized Lock-Rite Corporation, Rochester, N. Y., which will manufacture metal specialties.

George Whiteley, Assistant Superintendent of Motive Power, Canadian Pacific Railway, has been appointed superintendent of motive power, following the retirement of Robert Preston, after 53 years of service with the company. Mr. Whiteley started as fireman in 1902, at Fort William, Ont., and has seen service on the company's lines in all parts of Canada. He has been assistant superintendent of motive power since 1915.

Charles E. Wilson, has been elected vice-president of the General Electric Co. in charge of the merchandise department, with headquarters at Bridgeport and plants at New Kensington and York, Penn. He will supervise manufacturing, engineering, and sales. Charles E. Patterson retires as senior vice-president of the General Electric Co. and as president of the General Electric Supply Co. John L. Buchanan, succeeds Mr. Patterson as president of the General Electric Supply Co.

D. R. Wilson, President of the Wilson Foundry & Machine Co., Pontiac, Mich., has been elected a director of the Fedders Manufacturing Co., Buffalo.

OBITUARIES

William C. Aul, 66, President and General Manager of the Lyons (N. Y.) Fanning Mills for the past 49 years, died recently after a brief illness.

Frederick B. Farnsworth, 79, head of the McLagon Foundry Machine Co., and formerly with the Eastern Screw Corporation, New Haven, Conn., died on Dec. 24.

William Gardner, 65, Senior Vice-President and a director of the United Engineering & Foundry Co., Pittsburgh, Pa., died there on Dec. 28.

William Heintz, President of the Heintz Steel & Manufacturing Co., St. Louis, died on Dec. 26.

John W. McKeon, Vice-President of the West Michigan Steel Foundry Co., Muskegon, for nine years, died recently at Sierra Madre, Calif.

Walter E. Nichols, organizer of the American Tap & Die Corporation in 1905 and Nichols Brothers, both of Greenfield, Mass., died on Dec. 24.

George A. Ray, 55, Vice-President of the Taylor & Fenn Co., Hartford, Conn., since 1922, died on Dec. 30 at his West Hartford home.

Roswell W. Smith, 46, President of Albert Smith & Sons, Irvington, N. J., died on Dec. 28 at Millburn, N. J., after a heart attack.

Burton Wyman St. John, 57, President and General Manager of the Canadian Equipment Co., Ltd., died in Outremont, Can., on Dec. 19.

Louis Vierling, 76, Chairman of the Vierling Steel Works, Chicago, died on Dec. 27, after a brief illness.

FORTHCOMING MEETINGS

SOCIETY OF AUTOMOTIVE ENGINEERS —Annual meeting, Detroit, Jan. 19-23, 1931. John A. C. Warner, 29 West 39th St., New York, secretary.

STEEL FOUNDERS' SOCIETY OF AMERICA — Annual Meeting and Election, Jan. 29, Hotel Hollenden, Cleveland, Ohio. G. P. Rogers, Managing Director, 932 Graybar Bldg., New York City.

FIFTH MIDWESTERN POWER & ENGINEERING CONFERENCE AND EXPOSITION —Chicago, Feb. 10-14, 1931. G. E. Pfisterer, 53 West Jackson Blvd., Chicago, secretary.

WESTERN METAL CONGRESS AND EXPOSITION—Second National, Civic Auditorium, San Francisco, Calif., Feb. 16-20, 1931. Under auspices of A.S.S.T. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.

THREE-M-CONGRESS — Management, Maintenance, and Materials Handling Congress and Second National Industrial Equipment Exposition, Cleveland, Ohio, April 13-18. 1931. In the Arena and Exhibit Hall, Cleveland Public Auditorium. Information from the A.S.M.E., 29 West 39th St., N.Y.C.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Calvin W. Rice, executive secretary, 29 West 39th St., New York. The following meetings are scheduled:

Semi-Annual meeting, Birmingham, Ala., Apr. 20-23, 1931.

National Aeronautic Meeting, Baltimore, Md., May, 1931.

AMERICAN FOUNDRYMEN'S ASSOCIATION—Annual convention and exhibition, Stevens Hotel, Chicago, May 4-8, 1931, C. E. Hoyt, 222 West Adams St., Chicago, secretary.

AMERICAN GEAR MANUFACTURERS' ASSOCIATION—Annual Spring Meeting, Hotel Statler, Buffalo, May 7-9, 1931. T. W. Owen, 3608 Euclid Ave., Cleveland, secretary.

NATIONAL FOREIGN TRADE COUNCIL —Annual Convention, May 27-29, at the Hotel Commodore, New York City. O. K. Davis, secretary, 1 Hanover Square, New York, N. Y.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine tool business

NEW YORK

New Year's week turned out to be just what was expected, with the usual few orders and inquiries. Dealers expect the present conditions to remain unchanged until about the fifteenth, when industries take up the reins again. Many of the inquiries were of the bookkeeping variety, although there were a few that meant business, including one for a shaper, another for a cutter grinder. The Pennsylvania has ordered 46,500 tons of steel for 1,500 gondola cars. Federal Shipbuilding, Kearny, N. J., has a $17,000,000 order for four ships.

NEW ENGLAND

Tool transactions among New England industries over the turn of the year have been few and far between. Plants are busy taking inventory and figuring. Inquiries are fairly plentiful, and some companies show a good volume of orders pinned down with hold-up tags. New England construction packs an improved punch. About $500,000,000 of proposed construction, a lot of it representing industrial expansion, is in the making. More than half of this however, lacks financial courage.

This situation is typical of New England depression. Easy money hasn't helped. Executives look for improved conditions of substantial and steady duration only after a long, slow pull. Confidence is expressed that the long anticipated start has been made. Unfailing signs of progress have been made in the steel, textile, foundry, and shoe industries. Foreign prospects remain good, while the electrical industry and the automotive field are expected in soon.

LOS ANGELES

If it is true, as many individuals maintain, that, when a situation has become about as bad as possible there must necessarily be a decided improvement in the near future, then the machinery interests in this district have much to look forward to in the new year. It would appear to be the case, according to various authorities, that not only has the low level of the tool and equipment business been reached but that the bottom has been scraped and polished as well. As reported in these columns for several months past, oil field activities have added little to tool shop orders. Nor have the motion picture studios seemed inclined to place important tool orders during the period. The vocational and trade school shops are apparently striving to train their pupils with equipment already in use.

INDIANAPOLIS

This section enters the new year with much better prospects. During the last two or three months, there was a general resumption of production. The buying of special equipment for radio factories has been rather steady for the past three months. This applies also to the cabinet factories that have large orders.

Demand for special woodworking equipment is expected to improve further with the coming mid-winter furniture shows. The Indiana factories are confident of business. They have not bought heavily of machinery for some time. Demand from the railroads continues disappointing. No lists of any consequence are out in this territory and only emergency work is being done in the shops. Demand from the steel industry is not as heavy as it should be, but indications point to more activity from the structural steel business during the coming two months. The automobile industry also is dead insofar as tooling demands are concerned.

The electric and gas utilities continue to be rather good customers for special equipment.

EXPECTANCY continues to be the principal characteristic of machinery and machine tool markets, inquiries in many sections representing most of the current work. New years are expected to be ushered in with due and fitting ceremony, however, and the ceremonies are never accompanied by anything very serious in the way of business. Expecting nothing, tool men were not disappointed—in fact, some of them were a little cheered, and during office hours too.

NEW YORK expects no change until the 15th, with inquiries the feature. New England construction may add to order totals, while current inquiries are plentiful; there are increasing numbers of orders pinned beneath hold-up tags. The optimistic feeling there contrasts sharply with that in Los Angeles, where even the normally progressive film studios have forgotten that machine tools are an essential for operation and vocational schools are impressing their students with a love for antiques. Indianapolis prospects are better, with a variety of industries that need tools looking better.

CINCINNATI manufacturers and dealers are encouraged, expecting sales in the near future. Detroit, after a poor year, is expecting much better sales with increased automotive production. Canada enjoys the current extensive orders for railway rolling stock and equipment, this with other upturns brightening machine tool prospects considerably. Chicago inquiries are also much better, with rumored railroad inquiries there doing much to make pessimists change coats. Among the possibilities mentioned are the Northern Pacific, Great Northern, and Rock Island, and the Illinois Steel Co.

CINCINNATI

Machine tool manufacturers had a small volume of business, but quite a number of inquiries came in, these being principally for single tools. Some plants were shut down for the week-end following the New Year's holiday and some took advantage of the opportunity to work on inventories. Selling agents reported that business remained "as was," but they see some signs of improvement.

Several manufacturers state that a general follow-up of inquiries on hand has brought more than a little encouragement, as many of the responses indicate that purchases will be made before long. Additional encouragement comes from a survey of out-of-town selling agents, many of whom have reported to manufacturers that they see definite signs that users are about to resume buying.

DETROIT

With the automotive industry looking forward to a normal year of production and with supplies of machinery and equipment at a low inventory, tool dealers are preparing for a noticeable advance in sales. In general the last year did not come up to the expectations of the dealers. These expectations were not very high at any time so that the fact that there is disappointment now over the totals shows something of the depressed state of the trade for the year. December and the last half of November were particularly disappointing.

Based on the comparable 1922 recovery in sales, the coming year should be an excellent one, but no one is willing to predict that this will actually be the case. In general there is an uncertainty in the air, but it is probably due to the natural condition of industry at this season. The automobile and accessory plants are putting many men back to work, orders for materials are being released and car dealers report increased sales and improved prospects. None of this, however, is causing any noticeable optimism.

It will probably be three months at least before business in general and the machinery business in particular, shows any appreciable advance.

CANADA

Extensive orders for railway rolling stock and equipment and promises of more to come is the feature of the metal-working market in Canada. The Canadian Pacific Railway has placed orders with the National Steel Car Co. for 250 refrigerator cars; with the Canadian Car & Foundry Co. for 10 baggage and express cars and the steel frames of 45 passenger cars; while 100 flat cars will be built by the Eastern Car Co. In addition, it is understood the Canadian National Railway is preparing to enter into a contract with the Eastern Car Co. for 1,000 refrigerator cars.

Manufacturers of hydraulic equipment continue to reap the benefit of the big water power construction program. The Dominion Engineering Co. reports an order from the West Kootenay Power Co. for three 19,000-hp. turbines, and one from the Shawinigan Water & Power Co. for four 38,000-hp. turbines.

While conditions are still dull in the automotive trade, leading manufacturers are forecasting an increase in production and sales of fairly substantial proportions. Inquiries for machine tools are more numerous than they were a fortnight ago and prospects are considerably brighter for the early part of 1931.

CHICAGO

Receipt of belated inquiries from various sources, some of them for units of major importance, has had the effect of stimulating the belief that the early months of 1931 will witness materially improved business conditions. There still are those whose opinions do not tend toward an optimistic outlook for the near future, but since so many new inquiries have been received within the last ten days, quite a few classed as pessimistic are revising their forecasts. Reports regarding Western railroads are that new lists may be forthcoming within the next month or two, the Northern Pacific, Great Northern, and Rock Island being among those mentioned as prospective buyers. Also, it is understood, the Illinois Steel Co., will be interested shortly for considerable additional shop equipment. The Chicago representative of a mid-western plant specializing in automatic screw machines reports that the outlook of his company for an increased production for the first quarter of 1931 is of a more encouraging character than at any time during the last six months.

BUSINESS • BAROMETER

Industrialists, insisting the outlook is not so dark as it appears, are nevertheless buying from hand-to-mouth

THEODORE H. PRICE
Editor, Commerce and Finance, New York

AMERICAN stock exchanges are supposed to be prophetic in reacting to good news or bad. Until recently this rule has been borne out by the fluctuations in the value of securities, but during the past few months there has been a disposition to await the verification of bad news. This ability to proceed deliberately in the face of bank suspensions that have occurred is really astonishing to anyone who is familiar with the history of American finance.

These observations are prompted by the action of the market upon the rather sensational financial news published last week. The announcement that the four major railways of the East had agreed to a combination that would resolve them into four corporate groups was greeted by a substantial advance in railway stocks, while the depression that had occurred earlier in the week was chiefly due to the number of bank failures that were announced from day to day. The getting-together of the railroads is a very encouraging development, and it ought to assure an improvement in the situation unless freight and passenger rates are again advanced.

During the year 1930, including the last few days, which were estimated, about 1,200 bank suspensions or closings have been announced. Some of the suspended banks have re-opened, but the United States has never had such a situation to contend with before, and its ultimate effect is hard to gage. Total deposits of the closed institutions are believed to have exceeded $600,000,000. This is an enormous sum, and every thoughtful student of affairs ought to appreciate the steadiness with which the country's financial foundation and business superstructure have withstood the shock.

To give fluidity and life to this $600,000,000 of frozen resources is a job that may well attract the ablest financial genius in America. It will require but little real money to liquify the assets that are now congealed, and it begins to look as if business would improve promptly when the necessary liquefaction is accomplished.

Assistant Attorney-General Watson Washburn of the State of New York, retiring head of the Bureau of Securities, has rendered a final report on the investment trust situation to Attorney-General Hamilton Ward. In it, state supervision of the 270 investment organizations now operating within the state is recommended. The resources of these institutions amount to nearly $4,500,000,000. Some years will probably be required to correct the mistakes that have been made by certain investment corporations, and those who own stocks in these corporations ought to be promptly informed of the use that has been made of their money. When and if this is done, and when and if the assets of the 1,200 failed banks are made reasonably liquid, the wheels of business ought to begin to turn again without much friction.

Meanwhile it is undeniable that Wall Street is still pessimistic, and that its views are infecting those who operate on the various exchanges.

During the past week most of the important commodities declined. Cotton is perhaps, an exception, although the net advance has not been great, and people seem more interested in what the Farm Board will or will not do than in the price of the raw material itself.

Most merchants and many industrialists are insisting that the outlook seems darker than it is. They are buying as much as ever, although they are rigid in impressing the hand-to-mouth idea upon their buyers. The week's news is not important otherwise. The Bureau of Internal Revenue reports 26 persons in the United States with incomes of more than $5,000,000 in 1928. The report also includes a statement that there were 511 persons who had incomes of over $1,000,000 during that year. To the studious economist these figures are somewhat depressing, as they will probably increase the discontent of the poor without adding to the ecstasy of the billionaire. Meanwhile the talk of unemployment continues, and a great many of the would-be workers are said to be living on the charity so lavishly dispensed by the rich. The economic incongruities of such a situation are disturbing.

Silver is a shade lower, but the news from Great Britain, Continental Europe, and the East impresses one as more encouraging. But it should be borne in mind that it is difficult to obtain reliable news and that the information released should be read with due reference to the political and economic conditions which prevail amongst those who live in the Orient and compose more than one half of the world's population. If our surplus production of the staples that humanity requires could be distributed throughout China and East India, the famines that now prevail in some quarters would soon be relieved. To effect this distribution a few railroads are necessary and the cost of building them would probably be less than the sum which the Federal Farm Board has already invested in wheat and cotton. We recommend the suggestion to the consideration of Mr. Legge. If by any chance it should be adopted, 1931 could be made a prosperous year for the world.

THE BUSINESS WEEK

January 7, 1931

Though the death-rattle of 1930 is sufficiently sweet music in everybody's ears, the finale of the rather sour symphony of the past year adds some reassuring notes. . . . The records of the last week of the year are much less feeble than was expected, and are in some respects more encouraging than those of 1929. . . . Building contracts, merchandise carloadings, steel production, and check payments have held out surprisingly well against seasonal declines that might have been much more severe at the end of a bad year. . . . Basic commodity prices seem to have exhausted the possibilities of further decline. . . . Though the tangible effects of lowered Federal Reserve rediscount rates on the bond market are still to be tested, increasing support may be expected if the usual contraction of outstanding Reserve credit is not insisted upon when the large volume of currency in circulation returns to the banks in January. . . . Business sentiment is steadier and more alert, and the railroad consolidation news strikes a constructive note to start the new year. . . . It is still hard to see very far into 1931, but the atmosphere is slowly clearing, and we can give 1930 a good swift kick into oblivion with more confidence that it won't return.

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THE WEEKLY PRICE GUIDE . . . .

Rise and Fall of the Market

A SEASONAL up-turn, at least, is indicated in the present active inquiry for rails, track supplies, structurals, tin plate and steel for use by public utility concerns. Trading continues slow in small warehouse lots of non-ferrous metals, with the outlook obscured in copper, brass and bronze products. Red and white lead prices declined ½c. per lb., to 13¼c. for dry, f.o.b. New York. Linseed oil and brass wire also are lower than in the last week of December. Slight advances, however, occurred in slab zinc, fire clay and scrap lead.

(All prices as of Jan. 2, 1931)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI:	
Ala Foundry (Silicon, 1.75@2.25)	$14.19@$14.69
Tenn. Foundry (Silicon, 1.75@2.25)	14.19@ 14.69
NEW YORK:	
Buffalo No. 2 Fdry. (Silicon, 1.75@2.25)	20.41@ 20.91
BIRMINGHAM:	
No. 2 Foundry (Silicon 1.75@2.25)	14.00
PHILADELPHIA:	
Eastern Pa., No. 2x (Silicon, 2.25@2.75)	18.26@ 19.26
Virginia No. 2 (Silicon, 1.75@2.25)	22.29
Basic	17.75@ 18.25
CHICAGO:	
No. 2 Foundry, Northern (Silicon, 1.75@2.25)	17.50
No. 2 Foundry, Southern	17.51
PITTSBURGH: (including freight charge, $1.76, from Valley)	
No. 2 Foundry	18.76
Basic	18.76
Bessemer	19.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.00
Cleveland	4.75
Cincinnati	4.45
New York	4 75@5.00
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	1.90	3.35†	3.00	3.40†
No. 12	1.95	3.45†	3.10	3.45†
No. 14	2.05	3.55†	3.20	3.50†
No. 16	2.15	3.65†	3.30	3.60†
Black				
Nos. 18 to 20	2.15@2.25	3.60†	3.40	3.70
No. 22	2.30@2.40	3.75†	3.55	3.85
No. 24	2 35@2.45	3.80†	3.60	3.90
No. 26	2.45@2.55	3.90†	3.70	4.00
No. 28	2.60@2.70	4.05†	3.85	4.15
Galvanized				
No. 10	2.20@2.30	3.65†	3.50	3.55
Nos. 12 to 14	2.30@2.40	3.75†	3.60	3.65
No. 16	2.40@2.50	3.85†	3.70	3.75
No. 18	2.55@2.65	4.00†	3.85	3.90
No. 20	2.70@2.80	4.15†	4.00	4.05
No. 22	2.75@2.85	4.20†	4.05	4.10
No. 24	2.90@3.00	4.35†	4.20	4.25
No. 26	3.15@3.25	4.60†	4.35	4.50
No. 28	3.40@3.50	4.85†	4.70	4.75

*Light Plates. †400 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. butt..	56.14%	43.6%	53.3%	42.3%	57.3%	44.8%
3½ to 6 in. lap..	52.72%	40.18%	50.8%	37.8%	53.9%	41.4%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28
8	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	B.w.g. and Fractions	Outside Diameter in Inches—⅛	¼	⅜	½	1	1⅛	1¼
		Price per Foot—						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	7.00	6.00	6.15
Hoop steel	3.75†	4.00	3.75†
Cold rolled strip steel	4.95	6.00	6.10
Floor plates	4.85†	5.30	5.00†
Cold fin., round or hexagon‡	3.40	3.65	3.35
Cold fin,, flat or square‡	3.90	4.15	3.85
Structural shapes	3.10†	3.00	3.00†
Soft steel bars	3.10†	3.00	3.00†
Soft steel bar shapes	3.10†	3.00	3.00†
Soft steel bands	3.40†	3.65	3.20†
Tank plates	3.10†	3.00	3.00†
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, 3/16-in. thick by ¾-in. wide. †400 to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse—3/32, 8.35c. per lb.; ⅛, 7.85c. per lb.; 5/32 to ½, 7.35c. per lb.

METALS

Warehouse Delivery Prices in Cents Per Lb. for Small Lots:

Copper, electrolytic, New York			11.25@11.75
Tin, Straits, pigs, New York			29.50@30.50
Lead, pigs, E. St. Louis	4.95	New York	6.00@ 7.00
Zinc, slabs, E. St. Louis	4.12½	New York	5.75@ 6.75

	New York	Cleveland	Chicago
Antimony, slabs	9.50@10.50	10.50	10.75
Copper sheets*	20.75	20.75	20.75
Copper wire*	13.25	13.37½	13.37½
Copper, drawn, round*	19.25	19.25	19.25
Copper tubing*	23.12½	23.12½	23.12½
Brass sheets, high*	17.87½	17.87½	17.87½
Brass tubing, high*	22.75	22.75	22.75
Brass rods, high*	16.12½	16.12½	16.12½
Brass wire, high*	17.87½	18.37½	18.37½

*Mill, base.

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%†	24.00@25.00	24.30	23.30
Zinc sheets (casks)	9.75@10.25	11.25	10.36
Solder (½ and ½)	21.50	21.50	18@20

Babbitt metal, delivered in case lots, New York, cents per lb.:

Genuine, highest grade	45.00
Commercial genuine, intermediate grade	34.00
Anti-friction metal, general service	30.00
No. 4 babbitt, f.o.b.	10.00

†F.O.B.

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va.:

	Nickel	Monel Metal
Sheets, full finished	52.00	42.00
Sheets, cold rolled	60.00	50.00
Strip, cold rolled	55.00	45.00
Rods, hot rolled	45.00	35.00
Rods, cold drawn	50.00	40.00
Tubing	75.00*	90.00†
Angles, hot rolled	50.00	40.00
Plates	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper	7.75	8.50	7.25@ 7.75
Copper, heavy, and wire	7.50	8.00	6.75@ 7.25
Copper, light, and bottoms	6.50	7.25	6.00@ 6.50
Heavy lead	4.00	4.00	3.00@ 3.50
Lead battery plates	2.00	2.00	2.00@ 2.50
Brass, heavy, yellow	4.50	6.50	4.00@ 4.50
Brass, heavy, red	7.00	9.50	6.25@ 6.75
Brass, light	3.50	5.50	3.50@ 4.00
No. 1 rod-brass turnings	4.75	5.50	4.25@ 4.75
Zinc	1.50	1.50	1.25@ 1.50

TIN PLATES—Charcoal—Bright—Per box:

"AAA" Grade:	New York	Cleveland	Chicago
IC, 14x20	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.13	$0.16	$0.15
Cotton waste, colored, per lb.	.09½	.12	.10
Wiping cloths, washed, white, per lb.	.14	38.00 per M	.14½
Sal soda, per lb.	.01½	.02	.02
Roll sulphur, per lb.	.028	.03	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.	.092	.104	.098
Cutting oil, about 25% lard, in 5 gal. cans, per gal.	.65	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.	.33	.36	.24
Belting—Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin.ft., per inch of width, for single ply:			
Medium grade	30–10%	30–10%	35%
Med. grade, heavy wgt.	30%	30 –5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade	60%	50–10%	50%
Second grade	60–5%	60– 5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.031	$0.031	$0.0325
Cold fin. shafting	per lb.	.034	.034	.035
Brass rods	per lb.	.1612½	.1687½	.2125
Solder (½ and ½)	per lb.	.215	.2225	.3025
Cotton waste, white	per lb.	.13	.13	.13
Disks, aluminum oxide mineral, cloth, No. 1 6-in. dia.	per 100	4.59	4.59	4.59
Lard cutting oil	per gal.	.65	.65	.65
Machine oil	per gal.	.33	.33	.33
Belting, leather, medium	off list	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs	off list	65%	65%	50–10%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*	$6.03	$6.03	$6.03
Emery cloth*	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†	2.61	2.61	2.61
Cloth†	4.59	4.59	4.59
Fire clay, per 100 lb. bag	1.00	.75	.75
Coke, prompt furnace, per net ton	Connellsville,		2.40@2.50
Coke, prompt foundry, per net ton	Connellsville,		3.50@4.85
White lead, dry	100 lb. kegs	New York,	13.25
White lead, in oil	100 lb. kegs	New York,	13.25
Red lead, dry	100 lb. kegs	New York,	13.25
Red lead, in oil	100 lb. kegs	New York,	14.75

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less	65%
Larger, up to 1 x 30-in., full kegs, list less	65%
Less than full kegs or case lots, add to list	10%
Fitting-up bolts: list less	45%
Lag screws:	
Up to ½-in. x 6-in., list less	65%
Larger, list less	65%
Less than full keg or case lots, add to list	10%
Rivets:	
Structural, round head, full kegs, net	$4.50
Structural, round head, broken kegs, net	6.00
Tank, 7/16-in. dia. and smaller, list less	65%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less	65%
Larger, up to 3-in., list less	65%
Less than keg or case lots, add to list	10%
Washers:	
Wrought, full kegs, per 100 lb., list less	$4.00
Wrought, broken kegs, per 100 lb., list less	2.00
Turnbuckles:	
With stub ends, list less	20–10%
Without stub ends, list less	55%
Chain:	
Proof coil, base, per 100 lb., net	$8.50
Cast iron welding flux, per lb., net	.35
Bronzing flux, per lb., net	.50

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Colo., La Junta—Atchison, Topeka & Santa Fe Ry. Co., 80 East Jackson St., Chicago, Ill., M. J. Collins, Gen. Purch. Agt. — additional equipment for shops here.

Ill., Galesburg—Rowe Mfg. Co. (manufacturers of farm implements) — woodworking machines, spraying equipment, etc., for proposed 1 story, 112 x 126 ft. factory on West Third St. Estimated cost $50,000.

Mass., Boston — Bureau of Supplies & Accounts, Navy Dept., Washington, D. C.—will receive bids until Jan. 13, hacksaw frames, saws, cutting punches for Navy Yard here.

Mass., North Waverly—J. Buckley, 520 A. Bridge St.—heavy screw press for die work.

Mass., West Newton — Ruddick Co., 1577 Washington St.—a.c. electric drill.

Opportunities for Future Business

Calif., Los Angeles—Overland Terminal Warehouse Co., awarded contract for the construction of a warehouse on East 9th St. Estimated cost $650,000.

Calif., Oakland — J. Van Selzer, 1226 17th Ave., is having plans prepared for the construction of a 1 story, 50 x 100 ft. machine shop at 17th Ave. and East 14th St.

Conn., Bridgeport — New Era Construction Corp., R. D. Zappone, 511 5th Ave., New York, will build a storage warehouse and manufacturing plant at Noble Ave. and Harriett St. Estimated cost $100,000. Work will be done by separate contracts. Noted Dec. 25.

Conn., East Hartford — Texas Co., G. N. Beaton, Dist. Mgr., awarded contract for the construction of terminal buildings, including warehouse and boiler unit, 40 x 90 ft. garage, 42 x 80 ft. and two pump houses, each 15 x 16 ft. Estimated cost $200,000. Noted Dec. 4.

Conn., Hartford — Goodrich Silvertown Co., 145 High St., awarded contract for a 1 story, 30 x 128 and 50 x 70 ft. service station at Walnut and High Sts. Estimated cost $40,000.

Conn., Waterbury—Kaplan Bros., 352 East Main St., are receiving bids for a 1 story, 50 x 110 ft. automobile service station, garage, etc. Estimated cost $40,000. T. M. Freney, 69 Center St., Archt. Noted Dec. 18.

Ga., Atlanta—B. F. Goodrich Tire & Rubber Co., 501 Stewart Ave, S. W., plans the construction of a service station on Peachtree St. Estimated cost $60,000.

Ga., Pelham — Pelham Motor Co., received lowest bid for the construction of a 1 story, 60 x 100 ft. motor building from J. M. Culpepper & Son. Dennis & Dennis, Macon, Archts.

Ill., Chicago — Midland Specialties Co., 536 West 25th St., awarded contract for the design and construction of a 1 story, 84 x 130 ft. factory for the manufacture of oil measures and funnels on South Richmond St. Estimated cost $50,000.

Ind. Lafayette—H. H. Horner, had plans prepared for the construction of a 1 story, 130 x 165 ft. machine shop and garage on East Main St. Estimated cost $50,000. F. P. Riedel, Archt. Noted Apr. 24.

Md., Baltimore—H. C. Weiskittel Co., c/o E. Eyring & Sons Co., Third St. and Fait Ave., Contrs., awarded contract for the construction of a pipe foundry, pattern and machine shops, garage and gas range facotry at Philadelphia Rd. and Monument St.

Mass., Wellfleet—Powdrell & Alexander, Inc., 175 Connecticut Mills Ave., Danielson, Conn., plans the construction of a 2 story factory here. Estimated cost to exceed $40,000. W. B. Brennan, c/o owner, Engr.

Mich., Saginaw—General Motors Corp., General Motors Bldg., Detroit, awarded contract for the construction of a foundry here. Estimated cost to exceed $50,000.

N. J., Old Bridge—Anheuser-Busch Inc., c/o A. A. Busch, Pres., 721 Pestalozzi St., St. Louis, Mo., awarded contract for the construction of a yeast factory, 100,000 lbs. daily capacity, including machine shop, garage, power plant, etc., here. Estimated cost $2,000,000.

N. J., Perth Amboy—Ballinger & Co., 12th and Chestnut Sts., Philadelphia, Pa., Archts., will receive bids about Feb. 15 for the construction of a 1 story warehouse at Fayeth and Read Sts., here, for Greenspan Bros., 226 Washington St. $150,000.

N. J., Ridgefield—Lowe Paper Co., River Rd., is having sketches made for the construction of a 1 story lithograph shop. Estimated cost $50,000. Architect not announced.

N. Y., Long Island City — Crane Co., 836 South Michigan Ave., Chicago, Ill., awarded contract for a 3 story, 172 x 175 ft. warehouse and shop at Dutch Kills Basin and 47th Ave. Estimated cost $350,000. Noted Oct. 30.

N. Y., New York—Forty-Four West 66th St. Corp., postponed construction of 2 story service garage. Block & Hesse, 18 East 41st St., Archts. Project in abeyance. Noted Sept. 25.

N. Y., New York—Kenjohn Realty Corp., K. P. Steinrich, Pres., 362 West 23rd St., is having sketches made for the construction of a 6 story, 74 x 197 ft. service garage at 435 West 25th St. Estimated cost $400,000. L. E. Dell, Bogota, N. J., Archt.

N. Y., New York—R. Lowenthal, 1880 Grand Concourse, will receive bids after May 1 for the construction of a 50 x 190 ft. service garage, etc., at Bailey Ave. and 230th St. Estimated cost $150,000. A. Slavin, 2690 University Ave., Archt. Noted Oct. 9.

N. Y., New York—Star Co., 200 South St., plans the construction of a warehouse and industrial building at Water St. and Market Pl. Estimated cost $175,000. Lockwood, Greene & Co., 100 East 42nd St., Archts.

N. Y., New York — Twenty-Five Rose St. Corp., 11 West 42nd St., will not construct 3 story service and parking garage at 25 Rose St. $125,000. W. Shary, 22 East 17th St., Archt. Project abandoned. Noted Dec. 11.

O., Toledo—Libby Glass Co., Ash and Wheeling Lake E. R., awarded contract for the design and construction of a plant including machine shop, warehouse, engine room, boiler house, etc. Estimated cost $600,000.

O., Youngstown—Shell Petroleum Co., Shell Bldg., St. Louis, Mo., plans the construction of a warehouse and distribution plant. Estimated cost to exceed $100,000. Maturity indefinite.

R. I., Providence—J. J. Hahn, 323 Angell St., is having plans prepared for the construction of a 1 and 2 story service garage, etc. at Fountain and Empire Sts. Estimated cost $40,000. W. R. Walker & Son, 49 Weybosset St., Archts.

Tex., Fort Worth—John E. Quarles Lumber Co., 90 Jennings St., awarded contract for the construction of a lumber yard at Park Pl. and Frisco tracks. Estimated cost $42,000.

Tex., Galveston—City Council, will soon receive bids for the construction of a municipal airport, including hangars, repair shop, etc. Estimated cost $90,000. J. W. Baretta Engineers, Inc., National Bank of Commerce Bldg., San Antonio. Noted Dec. 18.

Wis., Sheboygan — Milwaukee Electric Railway & Light Co., 217 Michigan Ave., awarded contract for the construction of a 1 and 2 story, 40 x 180 ft. freight terminal, including motor bus garage here. Noted Nov. 20.

Ont., Guelph — Federal Wire & Cable Co., Ltd., plans the construction of a plant for the manufacture of insulated wire and cable.

Ont., Norland — S. Bryant, plans the construction of a saw and planing mill. Estimated cost $50,000.

Ont., Sandwich—Timken Roller Bearing Co., 728 Fisher Bldg., Detroit, Mich., plans the construction of a branch plant here. (Unofficial.)

Ont., Toronto — Crompton, Parkinson Ltd., Dagenham, England, manufacturers of electrical apparatus, plans the construction of a plant here.

The President—
The Superintendent--
The Works Manager-
The Chemist—
The Employee—
The Dealer—

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